THE VETERINARY RECORD

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 31. AUGUST 3, 1946 VOL. 58.

Therapeutic Treatment of Bovine Mastitis

by

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This paper records the results of an investigation designed to test the efficiency of three therapeutic substances in the treatment of bovine mastitis.

The following summary of recent literature may first be considered since the results have been instructive in our choice of therapeutic substances.

In earlier work, where sulphanilamide was administered by the oral route, some degree of success in alleviating the clinical symptoms of mastitis generally attended a somewhat prolonged course of treatment but the permanent elimination of *Str. agalactiae* from the mammary gland occurred infrequently. For instance, in the results reported by Stableforth *et al.* (1942) while 55 per cent. of 134 cases of mastitis due to *Str. agalactiae* were clinically cured, in only 34 per cent. was the organism eliminated. Furthermore, the effect of continued dosage produced toxic results in cows treated with sulphanilamide for five days. Not only did inappetence and diarrhoea supervene but there was a varying loss in milk during treatment, sometimes amounting to 40 per cent. of the total yield. The initial dosage of sulphanilamide selected in this experiment was 1 gram per 5 lb. body weight and this was followed by maintenance doses of 1 gram per 30 lb. administered every eight hours for five days. According to the preliminary work of Stableforth & Hignett (1942), this dosage of sulphanilamide gave an average concentration of drug in the milk which did not greatly exceed 10 mg. per cent. during treatment. This relatively low concentration of sulphanilamide may be responsible for the poor bacteriological results obtained, which hardly justify the expense and difficulty of oral treatment.

The effect of direct intramammary injection of sulphanilamide was first studied by Kakavas *et al.* (1942). It was ascertained that by injecting 40 ml. of a sulphanilamide (38 per cent.) mineral-oil mixture, a high concentration, 500 mg. per cent., was present throughout the milk in two and a half hours and that this declined to 25 mg. per cent. in 24 hours. In a trial of the value of intramammary injection of the mixture in four herds containing 265 cows, 251 (94 per cent.) were cured. The injections of sulphanilamide in oil were carried out daily for four days and, if infection persisted, the dosage was continued for eight days. A notable feature was that, according to the authors, the injections were bland and in only 2 per cent. of the cases was there any irritant effect. The freedom from irritation of this form of therapy has also been noted by Roberts (1944) who observed that 66 per cent. of quarters affected with acute mastitis improved after treatment; these findings were further confirmed by Johnson (1944).

Udder infusion with the acridine dyes, acriflavine and entozon, has been extensively tried with varying success. These therapeutic agents have the disadvantage that all concentrations of dye which produce good bactericidal results in infected quarters are also irritant and usually give rise to an inflammatory reaction which may persist for some days after treatment and be accompanied by a considerable loss in milk yield. Further, quarters of cows in full milk which are comparatively free from fibrosis require 500 to 1,000 ml. of the dye solution for infusion and this volume is allowed to remain in the gland for a short time only. Thus, the duration of one such treatment is about 30 minutes and is a laborious process when several cows have to be injected on more than one occasion.

Dubos (1939) showed that tyrothricin was highly lethal to Gram-positive organisms and its first application by Little *et al.* (1941) for the treatment of streptococcus mastitis met with successful results in that 82 per cent. of infected quarters were sterilized. The method was simple, consisting of injecting, after milking, 120 mg. tyrothricin in 40 ml. of a mineral-oil-water mixture and allowing the agent to remain in the quarter till the next milking. According to these workers, the injections produced only a mild reaction of the quarter and the fore milk was physically altered for no more than one to two subsequent milkings. Further evidence of the value of tyrothricin has been published by Tripp & Lawrence (1942), Martin (1942) and Schalm (1942), and in these investigations also it was observed that the treatment did not produce any marked irritation.

Intramammary injection of a colloidal suspension of 5 to 10 per cent. silver oxide in mineral oil was first introduced by Weirether *et al.* (1941) and their success with this substance in the sterilization of quarters infected with *Str. agalactiae* was later confirmed by Klein *et al.* (1941). According to the latter workers, injection produced considerable swelling of the udder and was accompanied by changes in the character of the secretion, although these changes were temporary. According to Spencer (1943), an inflammatory reaction is set up by this agent and most workers now agree that this form of treatment is irritant.

Therapeutic Substances Employed

According to the views quoted above, it appeared that the therapeutic agents worthy of further trial by intramammary infusion were sulphanilamide and tyrothricin. In addition, by the courtesy of Sir Howard Florey, we were given a small quantity of penicillin for an experimental trial in two cows in 1943 and later, by the consent of the Medical Research Council, a further small quantity was obtained.

The method of preparation of these three substances and their mode of application in the treatment of infected quarters may now be described.

1. *Sulphanilamide*

The preparation used by Kakavas *et al.* was a 38 per cent. emulsion of sulphanilamide in liquid paraffin and 40 ml. of this emulsion was injected into each quarter. It seemed to us that better results in the destruction of *Str. agalactiae* might be obtained by using a suspending base which was water soluble. With such a base it would be reasonable to suppose that a more rapid diffusion of the sulphanilamide throughout the mammary gland would be obtained. At this time lanette wax was being used in human medicine as a base for suspending sulphanilamide used in the treatment of burns (*Medical Research Council War Memorandum No.* 10). For such treatment 10 per cent. sulphanilamide was incorporated in a cream made from 10 per cent. lanette wax and 25 per cent. castor oil and other ingredients. On trial, such a base was too thick for injection by means of a teat syphon *via* the teat canal, into the cow's udder. It was found by experiment that the amount of wax could be reduced and that provided the oil content was kept at about the same level, a considerable quantity of sulphanilamide could be suspended and yet give an emulsion thin enough to be suitable for intramammary injection.

The emulsion finally employed and the technique of its preparation were as follows:—

Lanette wax	1 gram.
Arachis oil	20 ml.
Sterile distilled water	79 ml.

The wax and oil were sterilized in a steam sterilizer at 100° C. for one hour and sterile distilled water at the same temperature was added slowly. This base was homogenized by passing twice through a suitable machine and then 36·6 grams of finely ground sulphanilamide was added. The total volume of this mixture was found to be 122 ml. so that the concentration of sulphanilamide was 30 per cent. The temperature of the mixture was then reduced either in the refrigerator or in cold running water and maintained until it had settled to a semi-solid consistency. After this, it was broken up by thorough agitation with a spatula and again passed through the homogenizer. By this process an oil-in-water emulsion of the consistency of creamy milk was obtained in which the sulphanilamide remained uniformly suspended.

2. *Tyrothricin*

This product was obtained by the Agricultural Research Council for experimental trial and consisted of an alcoholic solution containing 120 mg. per ml.

3. *Penicillin*

In a preliminary trial penicillin was incorporated in a base similar to that described by Clark *et al.* (1943) in the treatment of burns. A small supply of penicillin powder containing 37 units per mg. was dispensed in the following cream base:—

Lanette wax	2 grams.
Arachis oil	4·8 grams.
Sterile distilled water	93·2 ml.

Sufficient penicillin (calcium salt) was dissolved in the sterile water to give a concentration of 250 units per ml. volume of cream. The arbitrary daily dose selected for injection into each infected quarter was 12,500 units.

At a later stage in the trial we obtained a further supply of penicillin solution which had been prepared by dissolving a quantity of the sodium salt in distilled water sufficient to give a concentration of 500 Oxford units per ml.

METHOD OF ADMINISTRATION

The 64 cattle used in these experiments were affected with clinical mastitis. Thirty-seven were purchased from farmers through their veterinary surgeons who had confirmed the presence of advanced disease and 27 were cows from the herds at this station. Before their removal from the farm, a clinical examination was made, a history of each animal was obtained, and quarter milk samples were examined by physical and bacteriological tests.

After removal of each animal to isolation premises at this station, a further series of three tests was carried out on consecutive days. By this means it was possible to determine with considerable accuracy the nature of the infecting organism and to obtain a satisfactory record of the extent of abnormality in the milk. Also before commencing treatment the milk yield of each individual quarter was recorded for comparison later with daily records taken subsequent to treatment.

When a diagnosis had been established by these tests, the infected quarters were treated in accordance with one or other of the programmes described below. The second and subsequent courses were only applied if infection persisted.

Group 1. *Primary treatment with sulphanilamide*

1st course.	4 daily injections of 50 ml. 30 per cent. emulsion.
2nd course.	4 further daily injections.
3rd course.	2 daily injections of tyrothricin.
4th course.	2 further daily injections.
5th course.	2 daily injections of penicillin cream or solution.
6th course.	2 further daily injections.

Group 2. Primary treatment with tyrothricin

1st course. 2 daily injections of 150 mg. in 25 ml. distilled water.
2nd course. 2 further daily injections of 150 mg. in 25 ml. distilled water.
3rd course. 4 daily injections of sulphanilamide emulsion.
4th course. 4 further daily injections of sulphanilamide emulsion.
5th course. 2 daily injections of penicillin cream or solution.
6th course. 2 further daily injections of penicillin cream or solution.

Group 3. Primary treatment with penicillin

1st course. 2 daily injections of 10,000 units.
2nd course. 2 further daily injections of 10,000 units.
3rd course. 4 daily injections of sulphanilamide emulsion.
4th course. 4 further daily injections of sulphanilamide emulsion.

The success or otherwise of any given course of treatment was assessed by its action on the causal organism and on the secretion as shown by the results of the daily tests taken during treatment and of three consecutive daily tests taken immediately after treatment. If a quarter or quarters failed to respond to the first course as judged by all three post-treatment tests, it was at once placed under the next course of treatment and the results of this subsequent course assessed in the same way.

It was hoped that by adopting this continuous method of applying the three therapeutic substances under trial, a comparison could be made of their relative efficiency when tested on the same infected quarter.

The criterion for the success of any given treatment was the absence of the causal organism from the milk at the three daily tests taken after the last injection and at eight tests taken at weekly intervals thereafter. In most animals under treatment, weekly and fortnightly examinations were continued until the end of the current lactation. Some of the purchased cows were in calf, while others were served after purchase so that tests and milk yield records could be continued in the subsequent lactation.

Infected quarters were stripped thoroughly before treatment. Injections were made with a teat syphon attached to a 5.0 ml. syringe by means of a rubber tube 4 inches in length. A separate, sterile syphon and rubber tube was used for each cow and if there was any suspicion that a syringe had become contaminated by back pressure from the udder, it was replaced by another sterile syringe before proceeding to treat the next cow. For the treatment of cows with different infections in different quarters, a fresh syphon was used for each teat. Later, because of the occurrence of primary tuberculosis of the udder in a treated cow, separate sterile apparatus was used for each animal. *The importance of using a separate sterile apparatus for each animal cannot be too strongly emphasized.*

Laboratory Tests

1. Milk samples, which were generally taken before afternoon milking, were examined by the following methods:—

(*a*) *Cultural Examination.*—The largest volume of milk that could be conveniently added to blood agar poured plates was selected as the inoculum for the cultural test, since it was thought desirable to make a quantitative examination of the number of infecting organisms present. 0·5 ml. of milk was plated in plain blood-agar as well as in Edwards' medium. The plates were incubated for 24 and 48 hours and readings made at both intervals. Media with and without crystal violet were used in the first examination since it was necessary to search for staphylococci, *C. pyogenes*, etc., which are sensitive to crystal violet, as well as for the more resistant streptococci. Later, when the type of organism was known, one variety of medium alone was used.

Colonies of the predominating organisms were picked into Hartley broth and glucose broth. If streptococci were present the serological group of the organism was determined, while staphylococci were examined for their power to coagulate serum and *C. pyogenes* verified by testing on solid serum.

By carrying out tests at daily intervals for three days, it was possible to determine the type of infection present in either one or more quarters, since the findings were generally constant. All quarters showing infection over the three tests were treated. In addition to studying the serological group of the streptococci present, the strains recovered were also submitted to type examination.

(*b*) *Centrifuged Sediment.*—In order to place an approximate value on the cellular content of the milk, a sample of the fore milk of each quarter was drawn into a modified Tromsdorff tube (described by Minett *et al.*, 1930) having a volume of approximately 10 ml. The sample was centrifuged at 2,500 r.p.m. for ten minutes and the amount of deposit then estimated in the stem of the tube.

(*c*) *Reaction.*—The reaction of the milk was judged by the colour obtained on mixture with 0·1 ml. 1:1,000 brom-cresol purple solution. The latter solution was conveniently placed in the sterile Tromsdorff tubes previous to taking the sample.

(*d*) *Sulphanilamide Content.*—An estimation of the concentration of sulphanilamide in the milk was also made. A method similar to that described by Fuller (1937) and by Stableforth & Hignett (1942) was employed. This analysis was carried out in the first place to find out the residual concentration in the milk 24 hours after the time of injection. It was not expected that the concentration would be high since there had been a morning milking intervening between the afternoon injection and the time of sampling, but it was necessary to evaluate the amount in the earlier work especially, since the concentration might have been so high as to have an inhibitory effect on organisms in the culture medium.

2. Since it is known that certain strains of streptococci isolated from human sources are resistant to sulphanilamide it was thought necessary to relate the results of sulphanilamide therapy to the *in vitro* sensitivity of the organism to this drug. Accordingly, each streptococcus strain was tested by placing inocula containing two graded dilutions of broth culture on the surface of blood agar containing a concentration of 1:2,000 sulphanilamide. This concentration was found by experiment to give reasonably clear-cut results between sensitive and resistant strains. The dilutions of cultures were prepared by adding 0·25 ml. to 10 ml. of saline and again by diluting this ten times. A loopful of the two dilutions was tested simultaneously on plain blood agar and on the medium containing sulphanilamide.

Results Obtained

Altogether 64 cows were treated and the number of cows subjected to the three different therapeutic courses previously described is shown in the following table:—

Table I

Number of Cows and Quarters Treated and Type of Infecting Organism

Treatment group	Total cows	Cows with a single infection of one or more quarters due to				Cows with more than one infection in affected quarters due to			
		Str. agalactiae	*Str. dysgalactiae* Group II	Staphylococci	*C. pyogenes*	Streptococci and *C. pyogenes*	Staphylococci and *C. pyogenes*	*B. coli* and *C. pyogenes*	Staphylococci and Group II
Group 1	46	41	—	2	1	—	1	—	1
" 2	10	5	—	1	2	1	—	1	—
" 3	8	4	2	2	—	—	—	—	—
Total	64	50	2	5	3	1	1	1	1
		78%	3·1%	7·8%	4·7%			6·3%	
Total infected quarters	154	133	3	8	9			1*	
		86·4%	2%	5·2%	5·8%			0·6%	

* = Infected in one quarter with both *Bact. coli* and *C. pyogenes*.

It will be observed that the number of cows showing infection due to *Str. agalactiae* was higher than that usually encountered and that this result may have been influenced by the fact that 27 of the cows treated were from two herds where clinical mastitis was due almost entirely to this organism. However, when the bacteriological data for the 37 cows purchased from outside farms is considered alone, it is found that 70 per cent. of these were suffering from chronic mastitis due to *Str. agalactiae*, a figure which approximates to the 78 per cent. found in the case of all the cows treated.

Primary treatment with Sulphanilamide (Group 1)

In the first group, 41 cows were infected in one or more quarters with *Str. agalactiae* and the number of individual quarters harbouring this organism was 105. Of these 78 or 74 per cent. recovered after one course of treatment (four injections); 12 quarters required a further course of four injections so that the total number of quarters responding to sulphanilamide therapy was 90 or 86 per cent. As will be seen in Table 2, six quarters failing sulphanilamide therapy later responded to two injections of tyrothricin, two quarters to two injections of penicillin and five quarters to two courses, *i.e.* four injections of penicillin. Only two quarters in this group failed to respond to all the therapeutic agents applied. The following observations may be made on the 15 infected quarters which required continuous treatments.

Cows 4 and 7, with four infected quarters resisting sulphanilamide, belonged to a herd where infection with *Str. agalactiae* was especially high and showed a marked tendency to spread. In the three infected quarters of Cow 4, the organisms could not be detected in milk samples taken during treatment but reappeared on the third day following treatment. With the one infected quarter (R.F.) of Cow 7 failing sulphanilamide therapy but responding to two injections of penicillin, it was noted that there was an abrasion of the teat orifice and it is possible that this may have permitted rapid re-infection of this quarter. In contrast, the other two infected quarters on this cow responded to one course of sulphanilamide. After remaining clear of infection for twelve tests in nine weeks, the R.F. quarter again became infected.

Cow No. 12 was infected in the L.H. quarter only and a marked fibrosis and clotting of the milk was evident at the time of treatment. No success attended therapy with sulphanilamide or with tyrothricin. During treatment with these substances, the secretion remained very abnormal and *Str. agalactiae* persisted in the samples. No change was observed after the injection of the two doses of penicillin (12,500 units) in lanette wax-oil base, but after four doses the organism disappeared and the secretion assumed a normal character.

There is no apparent reason to account for the failure of sulphanilamide to clear the four infected quarters of Cow 18, Cow 19 and Cow 24. The infected R.H. quarter of Cow 23 showed a scar at the teat orifice. After progressive treatment

TABLE II

NUMBER OF TREATED COWS AND QUARTERS WITH BACTERIOLOGICAL CURES OBTAINED

Primary treatment	Infection due to	No. of cows	No. of quarters	Bacteriological cures obtained in quarters						Failures
						Further treatment				
						Tyrothricin		Penicillin		
				4 daily injections	4 further daily injections	2 injections	2 further injections	2 injections	2 further injections	
(Group 1) 30 per cent. sulphanilamide emulsion	*Str. agalactiae*	41	105	78 (74%)	12 (86%)	6	—	2	5	2
	Str. dysgalactiae	1	1	1	..	..	..	..	..	0
	Staphylococcus	2	5	—	1•	—	—	—	1	3
	C. pyogenes	2	2	—	—	—	—	—	—	2
				2 daily injections	2 further daily injections	Sulphanilamide		Penicillin		
						4 injections	4 further injections	2 injections	2 further injections	
(Group 2) Tyrothricin 150 mg. in 20 ml. distilled water	*Str. agalactiae*	6	18	14 (78%)	—	2	—	—	—	2
	Staphylococcus	1	1	—	—	—	—	—	1	0
	C. pyogenes	3	7	—	—	—	—	—	—	7
	Bact. coli	1	1	—	—	—	—	—	—	1
				2 daily injections	2 further daily injections	Sulphanilamide				
						4 injections	4 further injections			
(Group 3) Penicillin 10,000 units in 20 ml. distilled water	*Str. agalactiae*	4	10	6	—	4	..			0
	Str. dysgalactiae	2	2	1	—	1	..			0
	Staphylococcus	2	3	1	1	—	—			1

.. = Not treated. • Treated with sulphathiazole. — = No cure.

with sulphanilamide and tyrothricin, no colonies of *Str. agalactiae* were recovered for three to four tests after treatment but organisms reappeared in succeeding samples. It was finally necessary to give four injections of penicillin to effect sterilization of the quarter. The two uninjured quarters of this cow, treated simultaneously, recovered after two courses of sulphanilamide.

Cow 26 was infected in three quarters and the secretion was so grossly altered as to consist of thick clots. Two courses, including five injections of 10,000 units of penicillin, were necessary in addition to the other courses before recovery was effected. After the penicillin injections, the secretion changed so that it was of the same character as normal milk. In this cow and in Cow 12, therefore, it may be said that penicillin was more effective than either sulphanilamide or tyrothricin in bringing about recovery in affected quarters where the secretion was originally grossly abnormal. In Cows 25 and 27, each with two infected quarters, there was complete failure to all treatments with one quarter of each cow; one of these quarters was in apposition to an infected supernumerary teat while the teat of the other contained a fibrous nodule.

Number of injections of sulphanilamide required to effect bacteriological cure

Since daily bacteriological tests were carried out during treatment, it has been possible to determine the efficacy of one or more injections in removing *Str. agalactiae* from the 78 infected quarters which recovered after one course.

The following table shows the number of quarters sterilized:—

Total quarters recovering in one course	No. sterilized by			
	1 injection	2 injections	3 injections	4 injections
78	30	29	14	5

Thus, the majority of quarters responded after two injections on consecutive days, but it is clear that to attain further success infected quarters should be subjected to four daily injections.

Relationship of therapeutic effect of sulphanilamide to the "in vitro" sensitivity of the infecting organism

At the time of commencing treatment, cultures of *Str. agalactiae* recovered from one or more quarters of the cow were tested for their *in vitro* sensitivity. By comparing the success or otherwise to one course of sulphanilamide treatment, it has been possible to judge whether there is any correlation between failure in treatment and the *in vitro* resistance of the strain to sulphanilamide.

Quarters treated with one course sulphanilamide	Cured	Not cured
105	78	27
No. infected with sensitive strain	63 (81%)	21 (78%)
" " resistant "	15 (19%)	6 (22%)

From the comparison set out in the above table, it may be seen that the results of applying one course of treatment are not correlated with the sensitivity of the strain since the groups comprising the responses and failures to treatment contain approximately the same proportion of sensitive and resistant strains. It is probable, therefore, that the success or otherwise of sulphanilamide therapy is not dependent on the *in vitro* sensitivity of the infecting strain of *Str. agalactiae* when a high concentration of the drug is established in the udder.

There is not sufficient evidence from this investigation to express an opinion on the frequency with which *Str. agalactiae* strains which are at first sensitive to sulphanilamide may become more tolerant during treatment. It was observed, however, that the sensitive strains from two infected quarters of two cows remained sensitive after two courses (eight injections) of sulphanilamide.

Relationship of sulphanilamide sensitivity of infecting strain to serological type

One representative culture from each infected cow was examined to determine the serological type of Group B streptococcus present.

A total of 37 strains were examined for serological type and also for their sensitivity to sulphanilamide (1:2,000) in blood agar.

The data obtained showing the relationship between these two characters are set out in the following table, from which it will be seen that the sensitive strains belonged, in the main, to types 1a and 3a, while the resistant strains were 1b and 3b. In the present survey sensitive strains of *Str. agalactiae* were more commonly isolated than resistant varieties.

Sulphanilamide 1:2,000 in blood agar	Total	Serological type			
		1a	3a	1b	3b
Sensitive	24	2	20	1	1
Resistant	13	0	1•	9	3
	37	2	21	10	4

• This strain was only moderately resistant.

Effect of Sulphanilamide on character of secretion

By making daily measurements of the sediment obtained by centrifuging 10 ml. of fore milk, a useful indication of the degree of cellular reaction in the secretion following injection has been obtained. In assessing the normality or otherwise of samples in respect of cell volume by the Tromsdorff centrifuge tube, a sediment of 0·01 ml. or under has been regarded as that of normal milk. (Minett *et al.*, 1930.)

Results showing the daily changes occurring in the milk of representative cows are illustrated in Table 3 (*Overleaf*).

In Cow No. 2 there were advanced changes in the milk before injection. During the four days of treatment the volume of the sediment was reduced and by the second day after treatment the character of the secretion was normal, although the reaction was alkaline. The nature of the change in the character of the secretion of the treated quarters of Cow 2 is typical of the progressive improvement obtained following treatment in cows approaching the dry state, such as Cows 3, 31 and 37.

Cow No. 30 shows the results of injection as usually seen in cows affected in the stage of active milk secretion, that is to say when

TABLE III.—BACTERIOLOGICAL RESULTS AND EFFECT OF TREATM
GROUP 1.—TREATMENT OF STREPTOCOCCUS MASTITIS W

Cow	Qr.	Pre-treatment Tests												Treat-ment	Treatment							Treatment						Treatment
		Cult.	B.c.p.	Sed.	Yld.	Cult.	B.c.p.	Sed.	Yld.	Cult.	B.c.p.	Sed.	Yld.		Cult.	B.c.p.	Sed.	Mg%	Yld.			Cult.	B.c.p.	Sed.	Mg%	Yld.		
Date		15.11.43				18.11.43				19.11.43				22.11.43	23.11.43							23.11.43						24.11
No. 2	L.F.	Inl.β	Acid	5ml.		Inl.β	Acid	2ml.		Inl.β	Acid	5ml.	½	X	500β	P	1ml.	32	½		X	50β	P	·01ml.	12	½		X
	L.H.	„	P	4 „		„	P	6 „		„	„	5 „	½	X	„	P	2 „	135	½		X	100β	P	1 „	15	½		X
	R.F.	„	Acid	5 „		„	Acid	5 „		„	„	5 „	½	X	„	P	5 „	6	½		X	10β	P	·5 „	60	½		X
	R.H.	„	P	4 „		„	P	1 „		„	P	1 „	¼	X	4β	P	·05 „	30	¼		X	—	P	·5 „	40	¼		X
Date														2.12.43			3.12.43				2.12.43			4.12.43			4.12
No. 2 cont.	L.F.													X	—	P	·01ml.		½		X	—	P	·03ml.	4	½		X
	L.H.																		½							½		
	R.F.																		½							½		
	R.H.																		¼							¼		
Date		15.11.43				18.11.43				19.11.43				21.11.43	22.11.43							22.11.43			23.11.43			23.11
No. 3	L.F.	—	Jp	tr.		—	Jp	tr.		—	N	tr.	3¾		—	N	tr.		4			—	N	tr.		3½		
	L.H.	—	N	„		—	Jp	„		—	P	·01ml.	4		—	N	„		3½			—	N	„		3½		
	R.F.	—	N	„		—	Jp	„		—	N	tr.	3¾		—	N	„		4½			—	N	„		3½		
	R.H.	Inl.β	P	2ml.		Inl.β	P	·05ml.		Inl.β	P	·03ml.	¼	X	—	P	·05ml.	0	¼		X	—	P	1ml.	50	¼		X
Date		20.3.44				21.3.44				22.3.44				23.3.44	24.3.44							24.3.44			25.3.44			25.3
No. 30	L.F.	Inl.β	Jp	·1ml.		Inl.β	Acid	clot		Inl.β	P	clot		X	10β	N	tr.	0			X	—	Jp	tr.	0			X
	L.H.	—	N	tr.		—	N	tr.		—	N	tr.																
	R.F.	Inl.β	N			Inl.β	Jp	·03		Inl.β	P	clot		X	1000β	N	tr.	0			X	20β	N	„	0			X
	R.H.	1000β	N	·1ml.		„	Jp	·03	12¼	„	P	„		X	200β	N	·02ml.	0			X	1β	N	„	0			X
Date		6.3.44				10.3.44				12.3.44				14.3.44	15.3.44							15.3.44			16.3.44			16.3
No. 31	L.F.	Inl.y	P	tr.		Inl.y	P	·03ml.		500y	N	tr.	1	X	—	P	·5ml.	2	1		X	—	P	·01ml.	2	½		X
	L.H.	„β	P	·05ml		„	P	·02 „		B+y	N	tr	¼	X	2β	P	tr.	2	¼		X	—	P	·01ml.	2	½		X
	R.F.	—	N	tr.		—	N	tr		—	N	tr.	3½	X	—	P	·05ml.	2	2½		X	—	P	slt.clt.	2	1		X
	R.H.	Inl.y	N	„		200y	N	tr.		Few y	N	tr.	3½	X	—	P	1ml.	2	2½		X	—	Jp	„	2	1		X
Date		27.7.44				1.8.44				3.8.44				8.8.44	9.8.44							9.8.44			10.8.44			10.8
No. 37	L.F.	—	Jp	tr.		—	N	tr.	1¼	—	P	tr.			—	Jp	tr.		1½			—	P	tr.		1½		
	L.H.	1000β	P	clot		500β	P	3ml.	¼	1000y	P	5ml.		X	—	P	1ml.		¼		X	—	P	1ml.		¼		X
	R.F.	—	Jp	tr.		—	Jp	tr.	¼	—	P	tr.			—	Jp	tr.		¼			—	Jp	tr.		¼		
	R.H.	—	Jp	·01		1000y	P	2ml.	¼	1000y	P	·01		X	—	P	2ml.		½		X	—	P	1ml.		½		X

GROUP 2.—TREATMENT OF STREPTOCOCCUS MASTITIS W

Cow	Quarter	Pre-treatment Tests								Treatment					Treatment					Treatment
		Cult.	B.c.p.	Sed.	Yld.	Cult.	B.c.p.	Sed.	Yld.	Cult.	B.c.p.	Sed.	Yld.		Cult.	B.c.p.	Sed.	Yld.		
Date		11.4.44				15.4.44				16.4.44				22.4.44	23.4.44					23.4
No. 75	L.F.	Inl.β	P	2ml.		Inl.β	P	clot		Inl.β	P	clot	2	X	—	P	slt. clt.	2		X
	L.H.	500β	P	1 „		„	P	·05ml.		„	P	tr.	3	X	—	P	·5ml.	3½		X
	R.F.	Inl.β	P	·5 „		„	P	clot		„	P	·01ml.	1½	X	—	P	1 „	1½		X
	R.H.	—	N	tr.		—	N	tr.		—	N	tr.	9½					10		
Date		11.5.44				12.5.44				22.5.44				25.5.44	26.5.44					26.5
No. 76	L.F.	1000β	P	·01ml.		1000β	P	1ml.		500β	P	·05ml.	2	X	—	P	clot	1½		X
	L.H.	—	P	tr.		—	P	tr.		—	P	tr.	4½					4½		
	R.F.	Inl.β	P	1ml.		Inl.β	P	·01ml.		200β	P	·05ml.	2½	X	—	P	2ml.	2½		X
	R.H.	—	P	·01 „		—	P	·02 „		—	P	·01 „	3½					3¼		

GROUP 3.—TREATMENT OF STREPTOCOCCUS MASTITIS

Cow	Quarter	Pre-treatment Tests								Treatment					Treatment					Treatment
		Cult.	B.c.p.	Sed.	Yld.	Cult.	B.c.p.	Sed.	Yld.	Cult.	B.c.p.	Sed.	Yld.		Cult.	B.c.p.	Sed.	Yld.		
Date		4.5.44				9.5.44				10.5.44				11.5.44	12.5.44					12.5
No. 89	L.F.	—	N	tr.		—	N	tr.		—	N	tr.	3½					3½		
	L.H.	—	N	„		—	Jp	„		—	N	„	4½					4½		
	R.F.	—	N	„		—	Jp	„		—	N	„	3½					3½		
	R.H.	500y	P	clot		1000y	P	5ml.		Inl.y	P	clot	1½	X	—	P	·02ml.	½		X
Date		11.5.44				12.5.44				22.5.44					26.5.44					
No. 91	L.F.	—	P	tr.		—	P	tr.		—	Jp	tr.	5					5½		
	L.H.	—	P	„		—	P	„		—	P	„	6					6½		
	R.F.	100β	P	2ml.		500β	P	1ml.		200β	P	1ml.	1½		—	P	·03ml.	1½		X
	R.H.	—	N	tr.		—	P	tr.		—	P	·01 „	10½					10½		

Brom-cresol purple reaction: P=purple, alkaline; Jp=moderately alkaline; N=normal. Sediment: ·01ml. regarded as normal / tr.=trace, regarded as normal.

Character and Yield of Milk at Successive Tests
ml. Dose of Sulphanilamide Emulsion 30 per cent.

| Cult. | Post-treatment Tests (Abridged) | | |

TABLE IV

EFFECT OF TREATMENT ON MILK YIELD OF COWS INFECTED WITH *Str. agalactiae*

Cow	Date of calving	Clinical data	Date of treatment	Treatment given	Quarters treated	Quarter	Daily milk yields in lb. (2 to 4 day periods) Before treatment	During treatment	After treatment	Date of next calving	Clinical data	Milk yields in next lactation
No. 2	April 1943	Fibrosis in all quarters. Secretion grossly abnormal in all quarters	22.11.43	Four daily injections of sulphanilamide 30 per cent. in lanette wax-oil base. Dose 50 ml. into each infected quarter	All	L.F.	¼ ¼ ¼ ¼	¼ ¼ ¼ ¼	¼ ¼ ¼ ¼	8.3.44	Normal	11 10 9¾ 9¼
						L.H.	¼ ¼ ¼ ¼	¼ ¼ ¼ ¼	¼ ¼ ¼ ¼			8½ 9¼ 8¼ 8
						R.F.	¼ ¼ ¼ ¼	¼ ¼ ¼ ¼	¼ ¼ ¼ ¼			8½ 9¼ 9 8½
						R.H.	¼ — — —	— ¼ — —	¼ ¼ ¼ ¼			5 5 4 3½
						Total	1¼ 1¼ 1¼ 1¼	2 2¼ 1¼ 1¼	1¼ 1¼ 1¼ 1¼			33 33½ 31 29¼
No. 3	May 1943	Fibrosis R.H. R.H. milk watery and small clots	21.11.43	Ditto		L.F.	3¾ 3½ 3¾	4 3½ 3¾ 3¾	4 4 4 4	5.5.44	Normal	8¾ 9¼ 9 8½
						L.H.	4 3½ 3½	3¾ 3½ 3¾ 3¾	4 4 4 4			9½ 9½ 9 8¾
						R.F.	3¾ 3½ 3¾	4¼ 3¾ 3½ 3½	3¾ 3¾ 3½ 3½			9¾ 9 8½ 8¼
					R.H.	R.H.	¼ — —	— ¼ ½ ¼	½ ½ ½ ½			8½ 9¼ 10 9½
						Total	11⅛ 10½ 11	12 11 11½ 11½	12½ 12½ 12 12			36½ 37 36½ 35
No. 31	September 1943	Slight fibrosis in all quarters and slight atrophy in L.F. Milk in L.F. and L.H. slightly abnormal	14.3.44	Ditto	All	L.F.	1 1	1 ¾ ¾ ¾	1 1 1¼ 1¼	13.10.44	Normal	3¼ 3½ 3¾ 3¾
						L.H.	¾ ¾	¾ ½ ¾ ¾	¾ ¾ ¾ ¾			5½ 5¼ 4¾ 4¾
						R.F.	3½ 3½	2½ 1 1 1	1¼ 1½ 2 2			5¾ 4½ 4½ 4½
						R.H.	3½ 3	2½ 1 1 1½	1¼ 2 2¼ 2¾			5 5¾ 5½ 5½
						Total	8¾ 8¼	6¾ 3¼ 3½ 3¾	4¼ 5¼ 6¼ 6¾			19½ 19 18½ 18¼
No. 37	October 1943	Enlargement and fibrosis in L.H. Secretion of L.H. grossly altered: R.H. slightly abnormal	8.8.44	Ditto		L.F.	1¼ 1¼ 1¼ 1¼	1¼ 1¼ 1¼ 1¼	1 1 1 ¾	22.10.44	Normal	7½ 6¾ 7½ 7¼
					L.H.	L.H.	½ ½ ½ ½	½ ½ ½ ½	½ ½ ½ ½			6¼ 6½ 6¾ 6¾
						R.F.	¾ ¾ 1 1	¾ ¾ ¾ ¾	¾ ¾ ¾ ¾			6½ 6¾ 5 6
					R.H.	R.H.	½ ½ ½ ½	½ ½ ¾ ¾	¾ ⅞ ⅞ 1			6½ 6¾ 6¼ 6
						Total	3 3 3¼ 3¼	3 3 2¾ 2¾	2¾ 2¾ 2¾ 2¾			26¾ 26½ 25¾ 26
No. 75	1.3.44	Swelling and slight induration of L.F. and L.H.	22.4.44	Two daily injections of tyrothricin. Dose 150 mg. in 25 ml. distilled water	*L.F.*	L.F.	2 2	2 1½	1½ 2 1¾ 1¾	2.4.45	Normal	8½ 8½ 8½
					L.H.	LH.	3 3	3½ 3½	3¾ 4 3¾ 3½			10½ 11½ 12
					R.F.	R.F.	1½ 1½	1¼ 1	1¼ 1¾ 1¾ 1½			7 7½ 7¼
						R.H.	9¾ 9½	10 10½	10¾ 10¾ 9½ 9½			9½ 11½ 10
						Total	16¼ 15¾	16⅝ 16½	17¼ 18½ 16½ 16			35¼ 39 37¾
No. 76	5.10.43	L.F. and R.F. abnormal milk. No apparent abnormality in udder	25.5.44	Ditto	*L.F.*	L.F.	2 1¾	1½ 1¼	1½ 1½ 1½ 1½	20.9.44	Normal	7 5½ 5¾
						L.H.	4¾ 4¾	4¼ 4¼	4¼ 4¾ 4¾ 4½			5¼ 5 5
					R.F.	R.F.	2½ 3½	2¼ 3¼	2¼ 2¼ 2¼ 2¼			5¾ 4¼ 4
						R.H.	3½ 3¾	3½ 3¾	3½ 3½ 3¼ 3¼			6¾ 5½ 5¼
						Total	12¾ 13½	12 12½	11¾ 12 12 11¾			25 20¼ 20
No. 89	17.11.43	Enlargement and slight induration of R.H. Secretion R.H. clotted	11.5.44	Two daily injections of penicillin. Dose 20 ml. containing 10,000 Oxford units		L.F.	3¾ 3½	3½ 4½	4½ 4¼ 4 3¾	8.11.44	Normal	7¼ 7¼ 7¼ 7¼
						L.H.	4½ 4	4½ 5¼	5¼ 5¼ 5 5			8¾ 8¾ 9 9
						R.F.	3½ 3¾	3¾ 4¾	5 4¾ 4¼ 4			6 6 6¼ 6¼
					R.H.	R.H.	1¼ ¾	1¾ ½	¾ ½ ¾ ¾			8½ 8½ 9 9
						Total	12¾ 12	13½ 15	15½ 14¾ 14¼ 13½			30½ 30½ 31¾ 31¾
No. 90	26.11.43	Enlargement and slight induration of L.H. Evidence of horning injury behind L.H. L.H. secretion clotted	11.5.44	Ditto. Also one course of sulphanilamide	*L.H.*	L.F.	7 6¾	7 6¾	7 6½ 6½ 6¼	27.10.44	Normal	9¾ 11½ 10¼ 11¼
						L.H.	1½ 1½	1¾ 1¼	1½ 1½ 1¼ 1½			7¼ 8 8¼ 8¼
						R.F.	6 5¾	5¾ 5¾	5¾ 5¼ 5 4¾			9¾ 11¼ 10 10¼
						R.H.	5 5	5 5	5¼ 4¾ 4¾ 4½			6½ 7¼ 7 7¾
						Total	19½ 19	19¼ 19	19½ 18 17¾ 17			33¼ 38¼ 35½ 38

the total yield is not below one gallon of milk per day. In such cases one or two injections of sulphanilamide may change the character of the secretion from a clotted state to that of normal milk.

The beneficial effect of sulphanilamide therapy in improving the character of abnormal secretion due to *Str. agalactiae* is, therefore, better appreciated in the lactating cow than in one approaching the dry state. Only in one of the 41 animals in this group could treatment be held responsible for markedly irritant effects. This cow was treated with a suspension freshly made from a new supply of sulphanilamide which was very granular. It is a point worthy of emphasis here that sulphanilamide for intramammary injection should be milled to a fine dust.

The effect of Sulphanilamide on milk yield

In the selection of a therapeutic substance for the treatment of mastitis, it would be a great advantage to employ one which did not adversely affect either the character or the quantity of the secretion. The daily milk yields of the individual quarters of the majority of treated cows were, therefore, measured with a view to deciding whether injections had the undesirable effect of depressing the milk yield.

It was found that in quarters yielding a moderate quantity of milk, *i.e.*, over 5 lb. daily, there may be a daily loss of 1 to 1½ lb. per day, during the four days of treatment, but the full yield is regained after the completion of the course.

The cows for which individual quarter records were obtained were, in the main, drying cows and in such animals it was observed that there was no increase in yield after successful treatment during the remainder of the lactation. Where cows affected with chronic mastitis accompanied by clotted milk were treated in early lactation, however, it was noted that an appreciable rise in yield resulted.

The yields of a small number of cows were measured in the lactation subsequent to sulphanilamide treatment in order to ascertain whether it had produced any beneficial effect. The records of four cows are shown in Table 4.

The yields for a period of four days before, during and after treatment with sulphanilamide are shown, as well as the records for four successive days in the lactation subsequent to treatment. During treatment it may be seen that there may be a loss of 1 to 1½ lb per quarter, as in Cow 31, although the small yields of Cows No. 2 and 37 are hardly affected. The post-calving records of these four cows are worthy of close analysis.

Cow No. 2 was originally affected in all quarters and the quantity of secretion was small and grossly abnormal. There was also fibrosis in all quarters. At the next calving the yield was over three gallons per day and the quantity secreted by the individual quarters was uniform except for the R.H. quarter which gave a smaller amount. Complete restoration was, therefore, effected in three quarters of this cow, since there was, in addition, no evidence of the induration present in the previous lactation.

Cow No. 3 was affected in the R.H. quarter and the yield was reduced to about one-sixteenth of that given by each of the other quarters. In the next lactation this quarter gave the same quantity of milk as the other healthy quarters and no clinical abnormality of the glandular tissue could be detected.

Cow No. 31 was affected in all quarters but only the L.F. and the L.H. gave abnormal milk with reduced yield. All quarters showed some degree of fibrosis with atrophy of the L.F. quarter. In the next lactation, the yield was level in all quarters except in the L.F. which gave a slightly reduced yield. No abnormality of the glandular tissue could be found at calving.

Cow No. 37 was practically dry at the time of treatment. Of the two affected quarters the L.H. showed enlargement and fibrosis and grossly abnormal secretion. In the next lactation the milk yield of all quarters was uniform and no fibrosis was detectable.

The examples furnished by these four cows demonstrate that regenerative changes within the udder may take place during the dry period following successful therapy in the previous lactation. It appears that if the inflammatory changes involving destruction of the secretory cells and the deposition of fibrous tissue are not too extensive, there is a reasonable chance of affected quarters resuming their normal function after the dry period.

Infection other than *Str. agalactiae*

In the first series of 46 cows treated, five were showing mastitis due to organisms other than *Str. agalactiae*. The bacteriological findings in the affected quarters are shown in Table 2.

The results of therapy in these cows were disappointing since the only quarter which responded to treatment with sulphanilamide was one infected with *Str. dysgalactiae*. It may be noted that the quarter of one cow infected with a staphylococcus responded to one course of sulphathiazole after failing with sulphanilamide. Similar treatment in infected quarters of another cow proved of no value beyond improving the character of the secretion.

While there did not appear to be any encouragement for developing sulphanilamide therapy for the treatment of mastitis due to staphylococci and *C. pyogenes*, there was a suggestion that penicillin might usefully be explored in staphylococcus infections. This point will be treated later in connection with penicillin therapy.

Primary Treatment with Tyrothricin (Group 2)

As will be seen in Table 2, there were six cows among which 18 quarters were infected with *Str. agalactiae*. Of these, 14 (78 per cent.) recovered after two daily injections of tyrothricin. Two quarters which failed to respond to this treatment were cured by one course of sulphanilamide while two quarters of one cow failing primary tyrothricin treatment could not be sterilized by any of the courses of treatment.

Effect on Character of Secretion and Yield of Milk

The extent of the changes arising after injection of tyrothricin into infected quarters is seen from the records of Cows 75 and 76 (Table 3). Following injection into infected quarters giving normal milk, it will be seen that some degree of irritation is set up which aggravates the inflammatory process already present. With the disappearance of *Str. agalactiae*, however, the character of the milk returns to normal.

Although there is a decline in the quality of milk during treatment, there is as a rule no accompanying decrease in the quantity. Cows 75 and 76 (Table 4) are fairly representative of this group and show that there may be a loss of ½ to 1 lb. per quarter for the two days of treatment only.

In Cow 75 the three infected quarters, L.F., L.H., R.F., gave a markedly reduced yield when compared with the uninfected R.H. At the subsequent lactation, however, there was little difference in the yield of all quarters.

Cow No. 76 further shows that the yield in the two infected quarters, L.F. and R.F., was slightly lower than that of the uninfected quarters. After the next calving, however, and following successful treatment, the yield was practically level in all quarters.

It appears, therefore, that the reaction produced by tyrothricin is entirely limited to an increase in cellular content of the fore milk for two to three days and that no permanent damage to the glandular tissue takes place.

Of the ten clinically affected cows subjected to tyrothricin therapy, a higher proportion were infected with organisms other than *Str. agalactiae* than in the sulphanilamide series. Thus the four cows in this class had nine infected quarters and of these seven were due to *C. pyogenes*, one due to a staphylococcus and one due to *Bact. coli*.

Tyrothricin was completely unsuccessful in the treatment of the *C. pyogenes* and *Bact. coli* cases which again resisted all forms of treatment. The quarter of the one cow infected with a staphylococcus resisted tyrothricin and sulphanilamide but was effectively treated with penicillin.

Primary Treatment with Penicillin (Group 3)

A total of six cows with 12 quarters infected with streptococci were treated with penicillin as a first treatment, using two daily injections of 20 ml. of sodium salt solution containing 500 Oxford units per ml. Of these seven (58 per cent.) were freed from infection. The secretion of four of the five remaining quarters was improved in character by four injections of penicillin although the organism was not destroyed. These five quarters responded to one course of four injections of sulphanilamide.

The effect of penicillin therapy in improving the character of the secretion is illustrated in Table 3.

Cow 89 was affected in the R.H. quarter and the secretion was grossly abnormal. Improvement was noticeable after the first injection of penicillin and on the 3rd day following treatment the milk was normal except for its alkaline reaction. The same rapid recovery took place in the R.F. quarter of Cow 91.

Penicillin, therefore, appeared to effect an improvement in the character of the secretion and to be non-irritant. Furthermore, there was no evidence in these experiments that the milk yield was influenced during treatment and the data furnished by Cows 89 and 90 (Table 4) demonstrated the restoration of milk yield in treated quarters in the next lactation.

Two cows with three staphylococcus infected quarters were included in this group. In one cow, the secretion was greatly improved and the number of staphylococci reduced after one course of treatment (four injections giving a total of 40,000 units). A further two injections, however, of 50 ml. sodium penicillin (25,000 units per injection) were required to sterilise the infected quarter. In the other cow infected in two quarters, the secretion was grossly abnormal in the L.H. Three injections of 50 ml. (total 75,000 units) sterilised the infection and the quarter produced milk normal in character. In the R.H. quarter the disease was very advanced and even six injections of 50 ml. (total 150,000 units) failed to sterilize the infection.

Therapeutic Value of Penicillin Compared with Sulphanilamide and Tyrothricin

In this investigation there was no previous evidence to guide us in the selection of a suitable dosage of penicillin for the treatment of mastitis. The evidence

available on local penicillin therapy was concerned with the treatment of burns in the Burns Unit at the Royal Infirmary, Glasgow (Clark *et al.*, 1943). These workers used a cream made from the lanette-wax-oil base and containing 250 units of penicillin per gramme. With the small quantity of penicillin kindly supplied by Professor Florey early in 1943, a similar cream was made for use in a preliminary trial on two cows infected with *Str. agalactiae* each with one infected quarter. The dosage arbitrarily chosen was 50 ml. containing 12,500 units of penicillin for injection into each infected quarter.

The results of this early trial were definitely encouraging and, in further work, the number of injections of this cream was limited to two, applied on successive days but in certain quarters four injections were given.

Owing to the small amount of calcium salt penicillin subsequently made available, its use was restricted in the first place to the treatment of cows which had failed other therapeutic courses.

(*a*) *In Str. agalactiae infection*

In the first group of 41 cows (Group 1) infected with *Str. agalactiae* the success of penicillin in a cream base in curing quarters refractory to sulphanilamide and tyrothricin was shown in the case of two cows. The R.F. quarter of the first cow responded to two injections (25,000 units) where other courses had failed. With the second, in one quarter (L.H.) which had resisted all forms of treatment, infection was eliminated after four daily injections.

The use of penicillin solution (500 units per ml.) with an injection of 20 ml. on two occasions into the R.H. quarter of one cow succeeded when other treatments had failed. In the case of a second cow, success was obtained after four injections of penicillin while a third required five injections.

In the series of 12 infected quarters, two due to *Str. dysgalactiae*, initially treated with penicillin (Group 3), seven recovered after two daily doses of 10,000 units.

From the results of these preliminary experiments, it may be suggested that with more abundant production of penicillin larger doses repeated twice or three times may prove highly successful in the treatment of *Str. agalactiae* infections.

(*b*) *In Staphylococcus infection*

The results indicated that a total unit value of at least 100,000 units of soluble sodium salt were required for the treatment of staphylococcus infection and that four or more consecutive daily injections of 25,000 units were necessary.

(*c*) *In C. pyogenes infection*

No effective treatment for *C. pyogenes* was found even with repeated large doses.

Discussion

The present results showed that about 86 per cent. of quarters infected with *Str. agalactiae* were cured bacteriologically by one or two courses, each of four daily injections of an emulsion containing 30 per cent. of sulphanilamide, and that clinical recovery could be effected in cases where the disease had not produced advanced atrophy of the quarter. It is probable that the success would have been higher had the injections been carried out after successive milkings instead of once each day. In assaying the concentration present after injection, it was found that there was no residual sulphanilamide after 24 hours, whereas at 14 hours the concentration, though extremely variable, might reach 100 mg. per cent. It would appear, therefore, advantageous to carry out injections after each milking in order to maintain a high bacteriostatic level of the drug.

While tyrothricin proved as efficacious as sulphanilamide in sterilizing infection, it has the disadvantage that it produces temporary disturbances in the secretion due to its irritant action.

Though the results of injecting two daily doses of penicillin were less satisfactory, it must be pointed out that the daily dosage of 10,000 units used was probably below the optimal on account of the limited supply available. In spite of this limitation, however, penicillin succeeded after two or more injections in seven quarters out of 15 which had resisted other forms of treatment.

The results obtained in the treatment of infection due to organisms other than streptococci were on the whole disappointing with all three substances. Five quarters infected with staphylococci were not influenced by sulphanilamide nor, similarly, were two quarters affected with *C. pyogenes*. Again, tyrothricin had no beneficial effect on seven quarters affected with *C. pyogenes* and one with staphylococci.

Penicillin also proved of no value in the treatment of mastitis due to *C. pyogenes* in spite of continuous treatment. There was evidence, however, that penicillin was more likely to be successful in the treatment of staphylococcus mastitis than the other two substances, provided adequate dosage could be administered. Thus, of eight quarters treated, infection was eliminated in four by doses which accounted for a maximum of 100,000 Oxford units. For routine use, therefore, it would appear that little success may be expected with daily doses smaller than 25,000 units and that administration needs to be continued until no organisms are secreted in the milk.

It was found that in clinical cases of streptococcal mastitis, the character of the secretion was improved after injection of sulphanilamide and penicillin and that the latter was devoid of any irritative action on the udder. This was also true for treatment with sulphanilamide with the exception of one cow out of the 41 affected with *Str. agalactiae*, where injection set up inflammatory reaction following the use of an emulsion made from sulphanilamide of coarse granular consistency. In general, it may be said that penicillin was the most bland of the products used and caused no loss of milk yield during treatment while a small loss of 1 to 1½ lb. per day attended treatment with sulphanilamide in early cases of chronic mastitis. Tyrothricin, on the other hand, was found to produce temporary catarrhal changes in the secretion which were in evidence for three days after injection, though there was no accompanying diminution in milk yield. The restorative tissue changes in the udder during the succeeding dry period following successful therapy have been found to influence favourably the subsequent milk yield of previously infected quarters.

During the course of this investigation, our attention was drawn to the occurrence of cases of tuberculous mastitis in the cows which had been subjected to intramammary injection. While our original intention had been to use only tuberculin-tested cows, we were obliged to accept also animals from non-attested herds since the available number of tubercle-free cows was small.

On *post-mortem* examination made of 25 out of the 37 purchased cows, Nos. 17, 23, 26 and 28 were found to be affected with tuberculosis involving the udder. In Cows 17, 23 and 28 the lesions appeared to be confined to this organ, while in Cow 26 there were advanced lesions in the lungs and pleura. A brief history of these cows is summarized below.

History Relevant to Tuberculosis of the Four Cows Showing Tuberculous Mastitis

Cow No.	History before purchase	Clinical findings	*Post-mortem* findings
Cow 17	From an attested herd; treated unsuccessfully by intramammary injection	Enlargement of R.F. quarter first noticed at time of calving 5 months after last treatment	Gross diffuse tuberculosis affecting R.F. quarter of udder and the supramammary lymphatic gland
Cow 23	From a herd in process of attestation; reactors present at recent tuberculin test but this cow had passed test	Slight enlargement without marked induration of R.F. was first observed about 6 months after last treatment	Small area of caseation due to tuberculosis in the right supramammary lymphatic gland; no gross tuberculous lesions in udder tissue but giant-cell formation found on section and biological test in guinea-pigs TB.+ on examination of material from R.F. quarter
Cow 26	From untested herd	Seven months after last injection a swelling about size of orange was first observed in anterior part of R.F. quarter	Gross tuberculous lesions in lungs and pleura. Gross tuberculous lesions in supramammary lymphatic and gross local lesions in R.F. quarter of udder
Cow 28	From small untested herd	7½ months after last injection first observed to have grossly swollen R.H. quarter	Gross diffuse tuberculosis of right hind quarter

At the time of treatment and observation, in each of the two isolation units where these cases occurred, cows were also housed which were later shown to be tuberculin reactors. In view of these circumstances three sources of infection appear possible.

1. *Contaminated Apparatus.*—At the time of treating these cows separate syphons were used for each animal but the same syringe was, on some occasions, used for several cows without sterilization between cows. The syringes, with the soiled syphon attached, were filled by withdrawing the plunger and pouring the therapeutic agent into the barrel of the syringe. Thus it is possible that infection in the syphon, resulting from unsuspected back-wash, was sucked back into the syringe and then carried to another cow. Unfortunately it is not known if Cow 26 was affected with tuberculous mastitis at the time of injection, nor could the order in which the cows were treated be recalled, but the possibility that infection was transferred in this way from Cow 26 to Cow 17 and/or Cow 23 on these occasions cannot be ignored as all three cows had been treated on the same day. On the other hand, we have no evidence that any of the cows injected with the same syringe as Cow 28 was suffering from tuberculous mastitis, though cows later shown to be tuberculin reactors had been injected on the days in question.

2. *Infection on Surface of Teat.*—The teat may have been contaminated with tubercle bacilli by the hands of the milker or other means. (It can be added here that the attendant had been

instructed to wash his hands in chloros solution between milking each cow.) Thus, though the cow's udder was washed with chloros solution and the point of the teat cleansed with 96 per cent. alcohol before injection, there remains the possibility that tubercle bacilli present on the teat meatus were carried into the udder by the teat syphon.

3. *Prior infection.*—The third possibility is that the animals under discussion were already infected with tubercle bacilli and that the injections favoured the localization and multiplication of the organism.

While it is difficult to state which of these methods was responsible for the appearance of primary tuberculosis of the udder in three of the treated cows, it is nevertheless clear that if transference of infection took place through the use of contaminated apparatus, this can be avoided by the use of separate syringes and syphons for each cow.

A comprehensive account of an outbreak of tuberculous mastitis in an attested herd following intramammary injections has been furnished by Macfarlane *et al.* (1944). Their findings, together with our own, serve to emphasize the danger of the adoption of the method on a widespread scale in the herds of this country unless adequate precautions are taken to ensure the sterility of the products and the apparatus used in the treatment of each cow.

SUMMARY

The results reported in this paper are concerned with a trial of three substances in the treatment of 64 clinical cases of bovine mastitis with a distribution of infection in 154 quarters. The disease was due to *Str. agalactiae* in 86 per cent. of quarters, *Str. dysgalactiae* in 2 per cent., *C. pyogenes* in 6 per cent., staphylococci in 5 per cent. and *Bact. coli* in 0·6 per cent.

For the treatment of the disease three substances, namely, sulphanilamide, tyrothricin and penicillin, were selected, and each substance was administered by intramammary injection. Sulphanilamide was injected in the form of an oil-water emulsion containing a 30 per cent. concentration, each infected quarter receiving, after milking, a course of treatment of 50 ml. on four consecutive days, succeeded by a further course if the first was unsuccessful. Tyrothricin was administered as a dose of 150 mg. in alcoholic solution diluted in 25 ml. of sterile distilled water, on two successive days and repeated if necessary. Penicillin, which was available in limited quantity, was injected in an oil-water emulsion in a dosage of 12,500 Oxford units on two or more days or as a solution of the sodium salt in a dosage of 10,000 units on two consecutive days.

The results obtained with each of these therapeutic agents in the treatment of mastitis due to *Str. agalactiae* were as follows:—

1. In 105 quarters of 41 cows, treated primarily with sulphanilamide, 78 or 74 per cent. responded to the one course (four daily injections) and a further 12 to two courses, so that a total of 86 per cent. eventually responded.

Of the 15 quarters failing sulphanilamide therapy, six responded to tyrothricin and seven to a further penicillin course, while two quarters only resisted all forms of treatment.

2. Of 18 quarters of six cows treated by two daily injections of tyrothricin 14 (78 per cent.) recovered. Two quarters resisting two courses of tyrothricin treatment responded to one course of sulphanilamide while the remaining two quarters of a single cow resisted all forms of treatment.

3. Of 12 quarters of six cows treated with penicillin, seven (two being infected with *Str. dysgalactiae*) responded to two daily injections of 10,000 units while five required one further course of sulphanilamide.

It has been demonstrated that the success or failure of sulphanilamide therapy in the treatment of streptococcus mastitis is not correlated with the drug sensitivity or fastness of the organism, but that there is a relationship between the latter character and its serological type.

The results of the use of these therapeutic substances in the treatment of mastitis due to organisms other than streptococci are discussed.

Acknowledgments

We would like to express our gratitude to Dr. W. S. Gordon, Director of this Station, for his constant interest and guidance throughout this work.

Our thanks are also due to Mr. D. H. McLeod for conducting sulphanilamide estimations and to Dr. A. W. Taylor for confirmatory work relating to udder tuberculosis.

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REVIEW

[Topley and Wilson's "Principles of Bacteriology and Immunity." 3rd Edition (1946). Revised by G. S. Wilson, M.D., F.R.C.P., K.H.P., and A. A. Miles, M.A., F.R.C.P. London: Edward Arnold. 2 vols. 2,054 pp. 60s.]

The continued advances in the science of bacteriology which have occurred since the last edition of this book appeared in 1936 have made the issue of a revised version very desirable. There are many bacteriologists, both medical and otherwise, in this country and abroad, who have come to regard it as a standard work of reference without equal in its own field among publications in the English language. Its reputation is based not so much on its being the reliable source of information which it is, as on the successful manner in which the exact position, so far as it is known, in respect to any particular aspect of the subject is presented. Often this takes the form of a carefully prepared and critical review of the relevant data and interpretations culled from the more important papers on the subject. Another of its valuable features, particularly appreciated by the investigator, is the provision of an extensive list of references at the end of each chapter.

On their success in producing an up-to-date edition of this book with its salient characters substantially unimpaired, the authors are to be congratulated, especially as it has meant undertaking a very heavy task under most difficult circumstances. The work of revision has involved a 25 per cent. increase in size which is distributed for the most part over a number of chapters; otherwise the only change in the make-up of the book is the omission of the chapter on the Bacteriology of Soil and the inclusion of two new ones of much topical interest and importance on Chemotherapy and the Bacteriology of the Air. It is gratifying to note that in the Preface the authors have expressed their intention of remedying in future any failure there may have been on their part, as the result of war conditions, to give fair representation to scientific literature from all parts of the world. It is felt that the importance of this attitude cannot be over emphasized at a time when its desirability does not always seem to be fully realized. The publication of this edition in two volumes will be generally welcome and the relatively small increase in price seems very reasonable under existing conditions.

While the veterinary bacteriologist is no less likely than any other to appreciate the outstanding merits of the book, he is bound to feel that greater attention could with advantage have been paid to certain aspects of the subject which fall within his own particular sphere, thus bringing the relevant sections of the text more nearly up to the general level of excellence of the remainder. There does seem at present some lack of proportion in this respect, as also in regard to the data given concerning various diseases that occur in animals. As an example of the latter, cattle plague is given rather less attention than infectious ectromelia of mice or vesicular exanthema of swine and no one is likely to gather from reading the text that an almost complete revolution in the control of this very serious disease has been effected during the past 15 years or so by the use of Edward's goat-adapted virus as a vaccine. There are quite a number of other illustrations which might be used to emphasize the point, but it seems sufficient to draw attention to the position and hope that it may be remedied in good time.

Weekly Wisdom

Facts are sacred but comment is free.—C. P. Scott.

CLINICAL COMMUNICATION

Foal Mortality—Retention of Meconium*

W. W. LANG, M.R.C.V.S.

Brigg, Lincs.

Experience of the years elapsing since the findings of the foaling seasons 1937 and 1938 as published in *The Veterinary Record*, confirms the writer's view that dullness, inappetence and retention of meconium compose the first clinical stage in cases of early death and, in the event of short survival (a few weeks), of joint ill; every case seen has the same history. Provided the treatment to be described is adopted within an hour or two of birth, gratifying results can be obtained. A record has not been kept of all cases, but an enormous amount of satisfaction has been got this year as foals treated—and all were ill—have been winning in the show ring: the first prizewinner at the Lincs. County show was one. In no case has joint-ill followed. One mare had lost her five previous foals, one from a dislocated neck, the others at some stage following retention, etc. The present owner of the mare had a successful issue last year and, taking courage, followed the animal to the Derby sales, bought her for £95, and got his reward in rearing a valuable filly foal (a prizewinner) which was treated, beating on occasion the previous owner. Of the five foals lost only one was treated by the author, with vivicillin, but unsuccessfully, and so the treatment has been readopted, with success.

Treatment.—This comprises the administration of sodium bicarbonate 1 oz., Dianimol ½ oz., aqua *ad* 8 oz., plus paraffinum liquidum 8 oz., by means of a funnel attached to a short piece of white stomach tube which is introduced through the mouth and a few inches into the oesophagus. In addition, an enema consisting of common salt 4 oz. in a gallon of lukewarm water is given. As a prophylactic the same treatment should be given to every foal, especially of the Shire and Clydesdale breeds, in this area as soon as possible after birth; it is intended to notify next year all breeders in this practice.

The manufacturers of Dianimol claim the coefficiency of this product to carbolic to be 43.

* Presented to the Annual General Meeting of the Lincolnshire and District Division, N.V.M.A., at Grantham, July 12th, 1946.

ABSTRACTS

[Effects of Stilboestrol on Retained Placenta. Moore, G. R. (1946.) *J. Amer. vet. med. Ass.* **108**. 79-83.]

Forty-three cases of retained placenta in cattle were treated with doses of stilboestrol ranging from 30 to 80 mgm. In some cases a single intra-muscular injection was given whilst in others it was repeated from one to three times. The cases included animals of both the dairy and beef breeds. Each case was submitted to careful manual exploration of the uterus before treatment; in all the 43 cases under review it was the opinion of a "competent clinician" that the placenta was too firmly attached to come away by itself in a reasonable time (48 hours).

Of the 43 animals treated, the author states that four were benefited, *i.e.*, loosening of the placenta was more rapid than would have been expected without treatment; nine were questionably benefited, *i.e.*, detachment of the placenta seemed to occur slightly earlier than in similar untreated cases; 25 received no benefit; and five suffered injurious effects. One of the latter group died, one was left permanently sterile, and three required protracted treatment before recovery was effected. The animal which died, a pure-bred Guernsey, became comatose 65 hours after the injection of 80 mgm. of stilboestrol. The coma resembled that seen in parturient paresis; the cow regained consciousness after receiving 500 c.c. of 20 per cent. calcium boro-gluconate, but relapsed into coma within an hour. Further injections of calcium boro-gluconate were unavailing, and the cow died after about 60 hours of the onset of the symptoms. At *post-mortem* examination the findings were negative. The author suggests that, while the connection between the coma symptom and stilboestrol administration may have been coincidental, it is also possible that the drug may have produced an endocrine upset which resulted in death.

In the other four cases stated to have suffered injury, violent straining commenced with the onset of oestrus in from 24 to 70 hours after stilboestrol administration. These animals were mature cows, with large well-relaxed vaginas which allowed the vagina to evert with each straining attempt. The violent straining produced defaecation in each case, and the author states that, as a result of the vaginal eversion and the repeated faecal contamination of the vaginal mucosa, three of the cows developed necrotic vaginitis and the fourth an acute catarrhal vaginitis. Three of these animals eventually recovered after lengthy treatment, whilst one developed a vaginal stricture that prevented further breeding.

In discussing the cases which are the subject of this paper, the author points out that "retained placenta" is a term commonly used somewhat loosely. He states that retention of the foetal membranes for from six to 24 hours is the rule rather than the exception with dairy cattle. Examination at this stage reveals that, in most cases, placental detachment is extensive and progressive, and slight manipulation causes the whole mass to drop away. This type of case, he continues, should not be confused with that in which there is extensive and firm retention with no tendency to separation within 24 to 72 hours after parturition. In the former type there are no uterine lesions, and the process must be regarded as essentially physiological. In the latter type, as several workers have pointed out, retention is due to, and a manifestation of, uterine lesions that existed before parturition, and it is this type that makes placental retention a major problem. The author thinks that the conflicting results which have been reported concerning the value of stilboestrol as an aid to expulsion of retained placentae may arise from a failure to distinguish between retention which is physiological and that which is pathological. Early treatment, without examination, therefore, leads to highly optimistic results because so many cases are included that do not need treatment.

As a result of the observations here recorded, the author concludes that (1) stilboestrol is of little, if any, value in aiding expulsion in pathological retention of the bovine placenta; and (2) stilboestrol may sometimes be definitely harmful in such cases.

N. J. S.

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[Effects of Stilboestrol on Pyometra Following Retained Foetal Membranes. Moore, G. R. (1946.) *J. Amer. vet. med. Ass.* **108**. 153-156.]

For this study, 43 cows with retained placentae were selected from herds in which breeding records were kept. The placentae were removed manually, none being removed in less than 72 hours after parturition and some remaining as long as 148 hours before it was considered practicable to do so. The only treatment at removal was to place a 1-oz. gelatin capsule of powdered sulphanilamide deep in each horn of the uterus.

Each case was examined about two weeks later, when it was found that all symptoms of acute inflammation had subsided, but that *in all cases a pyometra was present as evidenced by the presence of pus in the uterus and by retarded involution.* At this time, a single dose of from 30 to 50 mgm. of stilboestrol was given; this dosage was repeated in 70 hours if necessary. All cows were then bred at the first oestrous period after the 60th day following parturition, and were bred at each succeeding oestrus until conception occurred. For comparison of the results, a group of 50 retained placenta cases in previous years were selected for which complete breeding records were available; these control cows were never at any time treated with stilboestrol.

Forty-two of the 43 cows treated came in heat following one or two injections of stilboestrol, and began discharging pus from the uterus. In from two to seven days from the onset of oestrus, all uteri were empty and involution proceeded rapidly; the tubular genitalia regained excellent tone. The cervices were open in all cases.

All the above 42 cows conceived in from 60 to 140 days following parturition, the average time required for each conception being 86·2 days. The average number of services required per conception was 1·62. In the 50 cases selected as controls, the average time from parturition to conception was 144·8 days.

In the discussion of his results, the author apparently argues that no matter how much care is exercised in removing a retained placenta manually, pyometra is an inevitable sequel. This may be followed, according to its degree of severity and if left untreated, by complete sterility, or delayed conception and poor health, whilst in a large percentage of cases the succeeding pregnancy is pathological. Previously, the author had treated these cases by expressing the corpus luteum, which usually resulted in prompt recovery from the pyometra. In many cases, however, because the corpus luteum was so deeply embedded in the ovary, so much traumatic injury resulted from attempts at removing it that ovaritis and subsequent adhesions in the adnexae supervened.

From the results here reported it was concluded that stilboestrol has marked therapeutic value in the treatment of the pyometra which follows the manual removal of retained placentae in cows.

N. J. S.

Royal (Dick) Veterinary College, Edinburgh

Retirement of Professor Matheson and Professor Dryerre

Professor D. C. Matheson (Professor of Pathology and Acting Principal) and Professor H. Dryerre (Professor of Physiology) are due to retire from the staff of the Royal (Dick) Veterinary College at the end of the present session. At a very pleasant function held in the College on Monday, July 15th, Professor Matheson was presented with an engraved silver salver and book tokens, and Professor Dryerre was presented with a pair of prism binoculars and book tokens.

In making the presentations, on behalf of the College staff, Professor Boddie said they were met together to do honour to and to give concrete expression to the regard with which they held them.

Only Professor Mitchell and Dr. Greig knew the College before Professor Matheson and Professor Dryerre joined the staff. There were but four or five of the staff to-day who could recollect the Departments of Pathology and Physiology as they were in the early days of the period of office of Professor Matheson and Professor Dryerre. The extension and developments of their departments were tangible and abiding evidence of the zeal and foresight with which they had built during the years they had laboured.

Professor Matheson joined the staff of the College in 1913, thirty-three years ago. In his early days, Professor Matheson was the only member of the staff of the Department of Pathology. From these very small beginnings, he had had the satisfaction of seeing his staff slowly but steadily increase to its present dimensions.

Many interesting developments had taken place during these years, not the least important being the creation of the Department of Poultry Diseases which was still a unique feature in a Veterinary School in this country.

When Professor Dryerre was appointed in 1919, his office was a part-time one. With a perseverance that must be admired by all, he had gradually amassed technical and scientific equipment which made his department one that could compare most favourably with any of its size anywhere in the world.

Since Professor Dryerre became a whole-time member of the professoriate in 1935, he too had developed his staff, and it was an amazing contrast to compare the picture of a single-handed part-time professor with that presented by the present staff.

A very vivid illustration of the esteem with which the Physiology Department was now regarded outside the College was the fact that the College was approached to allow the dental students and the students of medicine of the Royal College of Surgeons, Edinburgh, to take their course of Physiology in Professor Dryerre's Department.

A few days ago, at the Prize Distribution, the Chairman of the Board of Governors had referred to the debt the College owed Professor Matheson for all he had done in the past year, while he had been Acting Principal. To those of them who were steeped in the tradition of the College, and who held her with very real affection, it had been a great joy to see how he had rallied the staff around him in a spirit of goodwill and comradeship. They would long remember with gratitude this signal service which he had done them.

Many of them had the happiest of recollections of the evenings when Professor Matheson addressed the Dialectic Society; these evenings were indeed an intellectual treat. Professor Dryerre's talents lay in another direction; some of them would remember his achievements as conductor of an orchestra. His rendering of Haydn's Toy Symphony was indeed a memorable experience.

They all hoped that though Professor Matheson and Professor Dryerre retired at the end of the session, they would still continue to come amongst their colleagues. Professor Boddie said he was sure he was speaking for all of the staff when he said they would miss their daily contacts with Professor Matheson and Professor Dryerre, and with all their hearts wished them many happy years of retirement.

Professor Matheson and Professor Dryerre were then asked to accept the presentations as a manifestation of the regard their colleagues had for them. In thanking the company for the presentation, Professor Matheson referred to the early days of his professorship and mentioned the transfer of the College from the old buildings in Clyde Street to the present buildings. He deeply appreciated the spirit which had led to that presentation, and he and his wife would treasure it, and it might be that when the time came, they might ask the Board of Management to accept the custody of the salver to be held with the other pieces of College plate.

Professor Dryerre said that leaving the College was admittedly a wrench, though the state of his health made it a relief to know that he would be free from the routine of teaching. He welcomed the suggestion that he should still continue to come to the College and perhaps his successor would allow him to have some little corner where he could finish off one or two pieces of research. The binoculars would be a great joy to him, as they would bring the hills to him, now that he could no longer go to the hills.

IN PARLIAMENT

National Health Service Bill

Through Third Reading

On Friday of last week the National Health Service Bill was read in the Commons a third time after an Opposition amendment for rejection had been negatived by 261 votes to 113. The debate was largely a repetition of what was said on second reading (*V.R.* **58**. 214-5), while the Report stage discussions (see below) were mainly a recapitulation of some of the more contentious disputes which occurred in standing committee. Replying to the debate the Minister of Health said that the Bill had emerged with its main structure unimpaired. Now on the third reading they desired to leave controversy behind them, and get the co-operation of the great medical profession and all health workers in the country, because without that co-operation the scheme was bound to fail.

When the House of Commons considered the Bill on report, Mr. House moved an amendment to clause 33 (Arrangements for general medical services) to secure that qualified nature cure practitioners should be recognized by the Executive Councils and that patients should be permitted the free and unfettered right to attend a practitioner of their own choice.

Mr. Ewart, who seconded, said it would not be a free health service if people who had a conscientious objection to accepting the orthodox medical treatment were not provided for.

Mr. Bevan, Minister of Health, said he was not going to be so indiscreet as to attempt to form a judgment on the relative merits of one form of therapy as against another. The amendment would place on the Executive Council in any area the obligation of providing whatever kind of medical attention any citizen might want. That would create an impossible position. If the House was going to place on the Minister the responsibility of providing a health service they must accept the obligation at the same time of defining that health service. So far Parliament had decided that the kind of health service which should be provided was that which was defined in the Medical Acts. But once a doctor had obtained such qualifications as entitled him to be placed on the medical register there was no interference with the kind of treatment which he gave. If the groups of healers which had been mentioned thought that they had something which was beneficial for mankind all they had to do was to obtain the necessary medical qualifications, and then they could give any form of treatment they liked.

The amendment was negatived.

On Clause 34 (Distribution of medical practitioners), Mr. J. S. C. Reid moved an amendment to exclude the words in the clause which limited the right of a doctor to get on the list of those who were in practice in that area before the appointed day. He said that if these words were omitted it would mean that any doctor would be entitled to go on to any list in any part of the country where he offered his services. This clause and those consequential to it were perhaps the biggest blot on the Bill because they had the most formidable and alarming possibilities with regard to the future of the medical profession and its independence and freedom. The Minister had said that one of the main reasons for bringing in this control of the movement of doctors was because it was necessary following the abolishing of the right of doctors to sell or buy goodwill. Thus this part of the Bill depended on ideological and not on practical reasons.

Was it necessary that this very elaborate system of control should be put upon the medical profession? Maldistribution could be cured much more easily by adjusting salaries.

Mr. Bevan said the amendment would wreck the Bill and the scheme, and the right hon. gentleman had made it clear that that was his intention. He (Mr. Bevan) was not saying that if a doctor did not enter the public service there should be any restraint on him; he could put up his plate wherever he liked; but if he wished to receive public remuneration the State was entitled to say that he should not serve where his services were not needed, which was a "negative control."

Mr. Linstead said that whether it was the intention of the Government or not, within five or ten years a large proportion of the medical practitioners of this country would become salaried servants of the State.

Mr. Willink said that the clause was so vague as to enable the Minister to turn a negative form of direction into something which in substance and reality was direction in its most positive form.

The amendment was negatived by 277 votes to 128—Government majority, 149,

Mr. Reid moved the deletion of Clause 35 (Prohibition of sale of medical practices). He said that the Opposition did not believe there was any intrinsic reason for abolishing the sale of the goodwill of a practice.

They should not mix up medicine with Socialism. There was no need to abolish the sale of goodwill at all, but if they did decide to do it it ought to be done in a much simpler way. Under the clause no doctor could sell his house to another doctor, enter into a partnership, or engage an assistant without going to the Medical Practices Committee. It was a monstrous imposition on busy men.

Mr. Bevan said that the State, having set aside the very large sum of £66,000,000, which the profession agreed was extremely generous, in compensation for the loss of goodwill, was therefore entitled to take precautions to see that a doctor did not get the thing twice. If the arguments of the Opposition were accepted the danger would immediately arise that a newcomer could give financial inducement to influence his appointment. That they must prevent, and the whole purpose of the clause, having abolished the sale and purchase of practices, was not to permit the succession of the practice to be influenced by financial considerations.

Comdr. Galbraith said that, by removing the sale and purchase of practices, the Government were removing the whole foundation of the independence of doctors.

The amendment was negatived by 305 votes to 110—Government majority, 195.

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Questions

Status and Salaries of Veterinary Officers of the Ministry of Agriculture

On Monday last Sir G. Jeffreys asked the Minister of Agriculture the number of staff for whom the Chief Veterinary Officer of his Department is responsible; and whether arrangements can now be made for him to enjoy the same status as the second Secretary.

Mr. Collick (Joint Parliamentary Secretary to the Ministry of Agriculture): The Chief Veterinary Officer is responsible for about 560 full-time professional and technical staff, and also for about 1,070 part-time local veterinary inspectors. The reply to the second part of the Question is "No, Sir."

Sir G. Jeffreys asked the Minister of Agriculture when he anticipates it will be possible to reach an agreed settlement for the salaries and status of the veterinary staff of his Department.

Mr. Collick: Discussions are still proceeding with the N.V.M.A., and I cannot say when a settlement is likely to be reached, though I hope that it will be fairly soon.

Sir G. Jeffreys asked the Minister of Agriculture if he will take steps to bring the salary scales for the veterinary officers of his Department into line with the other scientific services of the Government; and if he will arrange that the Government's Chief Veterinary Officer shall receive a salary not substantially less than the Government's Chief Medical Officer.

Mr. Collick: No, Sir. The revised scales for veterinary staff now under discussion with the N.V.M.A. have been framed in relation to those of other professional and scientific civil servants. As regards the second part of the Question, my right hon. Friend does not consider that the responsibilities of the Chief Veterinary Officer are comparable with those of the Chief Medical Officer.

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Bread (Animal Food)

Mr. Sparks asked the Minister of Food if he is aware that about two pounds of bread, per animal, is fed daily to about 10,000 greyhounds; and if he will make clear his policy in regard to the feeding of bread to animals during the period of bread rationing.

Dr. Summerskill: No, Sir. If my hon. Friend will let me have evidence in support of his statement I shall be glad to go into this matter. Animals may not, of course, be fed on bread unless it is unfit for human consumption.

Royal College of Veterinary Surgeons

July Membership Examinations

List of Successful Candidates

(*Continued from page* 330)

Glasgow:

First Year:

Anderson, Miss J. M.	Macdonald, I. S.
Baker, Norman	McDougall, J. S.
Boyd, H. W. (C)	McKay, T. M.
Buchanan, John (C)	Madden, Edward
Crighton, G. W. (C)	Morgan, D. L.
Drummond, Miss C. P.	Mowat, G. N. (C)
Forrester, W. A.	Ronan, Wm.
Filshie, H. P.	Shepherd, Gordon
Fraser, A. F.	Stanhope, D. T.
Gracie, Archibald (C)	Strachan, T. A. (C)
Harkness, A. C.	Sturdy, I. C.
*Hosie, K. F.	Tattersall, D. J.
Hyatt, Miss J. M.	Vallely, T. F.
*McCrone, R. R.	Wright, E. D.

* denotes 2nd Class Honours.
(C) denotes credit in Chemistry.

Second Year:

*Bain, Miss M. L.	*Jarrett, W. F. H.
Barclay, J. M.	Lawson, John
Bennett, J. R. (H)	McAdoo, S. D.
Boyd, R. P. (H)	Mackie, A. M. (P)
Dunn, T. J. (P)	*McMeekin, W. J.
Garrett, J. A. L. (P)	Millar, J. S.
Hair, D. C.	Mount, Miss E. D. (P)
Hamilton, D. F.	Patterson, N. M. (P)
Harris, G. D. (P)	Reid, A. N. D.
Harrison, N. J.	Russell, David
Hillman, R. W.	Spence, Norman
Howieson, J. T. (P)	*Sutton, Miss B. M.
Jackson, W. T.	Wilson, R. L. (P)

* denotes 2nd Class Honours.
(P) denotes credit in Physiology.
(H) denotes credit in Histology.

Third Year:

Aharoni, Chanan	Grindlay, Maurice (A)
Barr, R. B.	Leslie, Miss M. G.
Brown, William	McPhedran, Duncan (A)
Cameron, I. H. (A)	Moors, Wm. (H)
Carmichael, A. M. E.	O'Hagan, Charles (A)
Crawford, Miss D. A.	Paton, I. M.
Douglas, T. A. (P)	Torley, J. A.
Frame, James	Warnock, Hugh
Goodwin, Robt.	Williams, Miss L.
Gordon, Miss E. D.	Young, I. J. B. (H)

(P) denotes credit in Pharmacology, etc.
(A) denotes credit in Anatomy.
(H) denotes credit in Hygiene.

Fourth Year:

Barr, W. A. B.	Pfaff, H. W.
Besant, J. B.	Raeside, Hugh
Cullen, J. T.	Robertson, J. S.
Findlay, W. L.	Ross, J. G.
Kight, D. G.	Semple, Matthew
McCracken, David	Simpson, Bert
MacDonald, Miss E. F. F.	Sumner, K. C.
McGown, S. W.	Urquhart, G. M. (Paras)
Martin, W. B.	Wilson, Miss A. (Path)
Murdoch, W. A.	Wright, Miss C. M.

(Path) denotes credit in Pathology.
(Paras) denotes credit in Parasitology.

Final Year:

Dickie, A. T.	Lawson, D. D.
Evans, L. A.	Porter, Miss E.
Forteath, A. D.	Roberton, D. P.
Jarvie, Thomas	Stevenson, J. B.
Johari-Bin, M. D.	Young, G. B. (M)

(M) denotes credit in Medicine.

Liverpool:

First Year:

Jones, C. (at Edinburgh) Wells, C. F. (at Edinburgh)

Second Year:

Bacon, William
Barlow, Miss B. J.
Cayless, Miss B. G. (P)
Cole-Powney, J. H. M.
Errington, A. E.
Forster, P. E. (P)
Forster, Roy (P)
Griffith, Edward (P)
Grime, P. A.
Hooper, Miss G.
Keeble, S. A.
Mason, Harry
Medcalf, Miss R. I.
Morgan, W. J. B. (P)
Parry, R. T.
Perry, P. F.
Roberts, Miss E. G.
Smith, Miss M. B. (P)
Teer, James
Theobald, C. G.
Woodhead, A. T.

(P) denotes credit in Physiology.

Third Year:

*Allcock, James
Field, A. C. (H)
Fisher, Miss P. M.
Gee, Miss B. G. (A)
Greasley, John (A)
Griffiths, Laurence (A)
Hargreaves, P. R.
Harrison, W. J. (A) (H)
Hill, K. J.
Jones, Elwyn
Morten, D. H.
Myerscough, S. F. (A) (H)
Scarnell, John (A) (H)
Watkins, I. M.

* denotes 2nd Class Honours.
(A) denotes credit in Anatomy.
(H) denotes credit in Hygiene.

Fourth Year:

*Barker, I. R.
Broughton, J. E.
Carus, Alex.
Curtis, P. E.
Davies, E. T.
Davies, Ifor
Evans, Oswyn
Haigh, Brian
Hignett, P. G.
†Holmes, J. R.
Lees, Miss Peggy
Llewellyn, D. G.
Murch, Oliver
Shepherd, Edward
Walley, J. K. (Paras)
Wilding, M. H. (Paras)

† denotes 1st class Honours.
* denotes 2nd Class Honours.
(Paras) denotes credit in Parasitology.

Final Year:

Beaumont, Wilfred
Haining, Mrs. R. V.
Mills, Miss Susan
Ockey, J. H.
Penny, R. H. C.
Scarisbrick, Ronald (S)
Wilkinson, G. T. (S)

(S) denotes credit in Surgery.

Dublin

First Year:

Burke, K. N. M.
Hanley, S.
Harney, J.
Hogan, M.
Lunny, Kevin
McAlinden, J. H.
McDougald, W. L.
O'Hart, Patrick
Roche, L.

Second Year:

Barry, J. G.
Coghlan, F. X.
Collins, S. McC. (P)
Corr, J.
Dineen, C. (P)
Downey, N. E.
Fanning, J. J. (P)
Gilchrist, G. M. (P)
Lane, Morgan
McCarthy, M. (P)
McGettigan, J. F.
*Mackle, T. A.
Mahon, F. (P)
Murdock, C. A. (P)
Murphy, E. C. (P)
Murphy, P. F.
O'Kelly, C. D.
Prendiville, D. B.
Reihill, J. P.
Rooney, A. M. (P)
Ryan, G. M.
Stephenson, J. A. (P)
Stewart, P.
Thornton, T. J.
Walls, W. T.

* denotes 2nd Class Honours.
(P) denotes credit in Physiology.

Third Year:

Coghlan, M. J.
Cox, J. R. M.
Dawson, R. M.
Fennelly, P. W. (A)
Galvin, T. A.
Jennings, Richard
Knightly, M.
*Loughlin, David
McCauley, P. J. (A)
McIvor, J. G. (A) (H)
O'Byrne, Eoin
O'Connor, Daniel (A)
O'Sullivan, C. G. (H)
Powell, W. V.
Stack, Robert
Stewart, D. J.
Sweeney, E. J. (P)
Walsh, E. A.
Warmington, J. C. (A)
Woods, R. H.
Woulfe, M. R. (A)

* denotes 2nd Class Honours.
(P) denotes credit in Pharmacology.
(A) denotes credit in Anatomy.
(H) denotes credit in Hygiene.

Fourth Year:

Alford, G. A. (Paras)
Bradbury, Miss J. M.
Brown, Samuel
Byrne, J. J.
Byrne, P. J.
Coe, Thomas
Conlon, P. K.
Corcoran, J. F.
Curtis, R. G.
Dineen, Joseph
Dodd, Luke
Farrell, T. M.
Feeney, G. H.
Forde, L. P. (Paras)
Gormley, P. D.
Keane, Cornelius
Lynch, T. J.
McCann, W. J.
McNamara, E. J.
Martin, Hugh
O'Gorman, D.
*Prendergast, W. J.

* denotes 2nd Class Honours.
(Paras) denotes credit in Parasitology.

Final Year:

Bourke, J. P.
Casserley, Patrick
Coard, E. F.
Cremin, C. J.
Daly, P. J. (M)
De Lacy, T.
Finn, J. J.
Gavagan, P. B.
Greenwood, J. J.
Higgins, P. K.
Hirsch, E. A.
Hutchinson, R. W.
Kelly, W. H. B.
McCrea, C. T.
McDermott, M. J.
McDonald, R. C.
McFerran, A. M.
McGettigan, C. J.
McGuinness, T. P. H.
McNally, G. K.
Maher, K. J.
Moffitt, T. F.
Molloy, P. F.
Monaghan, D. H.
Moore, George
Murphy, P. A.
Murphy, T. (Dublin)
Murphy, T. (Palatine)
Nicholson, J. T. (M)
O'Brien, Cornelius
O'Scanaill, T.
Owens, C. P.
Ross, J. K.

(M) denotes credit in Medicine.

(Concluded)

A WORLD COUNCIL OF UNIVERSITIES

A "World Council of Universities" to achieve co-operation between universities of all countries was advocated in a report, prepared by the British Association, and dealing with the relationship between the universities and Unesco, which was discussed at a meeting in London last week.

Sir Alfred Zimmern, who presided, outlined the plans and policies of Unesco in regard to co-operation. He said it was probable that as a result of some of Unesco's projects there would be a regular interchange of teachers and students of institutions preparing candidates for careers involving international contacts. He was getting back to the concept of the international university.

Dr. J. C. Maxwell Garnett, outlining the British Association's report and proposals which resulted from a three-year study, said the average undergraduate should be offered a course of study that would fuse religion and science into one rational scheme of thought. The report recommended the institution of a new school of natural and social philosophy and the introduction of sociology and citizenship into all specialized honours schools. It urged that Unesco should help to raise the standards of entrance to most universities and that there should be in universities one universal auxiliary means of international communication, the best means available being basic English.

* * * * *

A cattle show of a kind entirely new to this country, and embodying many unique features, is to be held this autumn at Slinfold, Sussex. It will be confined to one breed only—Jerseys—and, although the judging on the day will be carried out on more or less traditional lines, the qualifications for entry are production records and breeding achievements of a very high standard. The whole aim of the event is to demonstrate that show type Jersey cattle are also heavy milking cattle. Every animal entered will also be Attested and, of course, officially milk recorded.—*Farmers' Weekly.*

NOTES AND NEWS

Diary of Events

Aug. 7th.—N.V.M.A. Committees at 36, Gordon Square, London, W.C.1. Committee to make nominations for composition of Standing Committees for 1946-47, 11 a.m.; Finance and General Purposes, 2 p.m.

Aug. 7th and 8th.—Summer Meeting of the British Society of Animal Production, at Glasgow. (See Notice.)

Aug. 14th.—Meeting of the Editorial Committee, N.V.M.A., 2.30 p.m. (Abstracts Sub-committee, 1.45; Clinical Sub-committee, following main Committee.)

Aug. 31st.—Meeting of the Society of Women Veterinary Surgeons at Chester (Queen Hotel), 2.30 p.m.

Sept. 23rd-27th inclusive.—Annual Meeting and Conference of the National Veterinary Medical Association of Great Britain and Ireland, to be held in London.

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Penicillin Available Shortly for Use by Veterinary Surgeons in the Treatment of Bovine Mastitis and Other Diseases of Dairy Cattle

By arrangement with the Ministry of Supply and the Ministry of Agriculture and Fisheries, penicillin is shortly to be made available for use by veterinary surgeons in the treatment of bovine mastitis and other diseases of dairy cattle.

Veterinary surgeons wishing to obtain supplies during the period as from August 1st, 1946, to October 31st, 1946, should apply to the GENERAL SECRETARY, NATIONAL VETERINARY MEDICAL ASSOCIATION, 36, GORDON SQUARE, LONDON, W.C.1, for the necessary application forms on which they will be asked to state the firm from which they wish to obtain their supplies of penicillin. These firms will, on approval of the application, be appropriately licensed under the Control of Penicillin (No. 1) Order, 1946, to effect supply.

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Pharmacists' Reaction to Ministry's Procedure

"We have no doubt that pharmacists would be surprised if we did not make some further observations on the decision (reported last week, p. 32) by the Ministry of Supply to grant a restricted form of licence for the supply of penicillin to veterinary surgeons," states *The Pharmaceutical Journal* in its issue of July 27th, and continues: "It appears that this licence will (*a*) be granted only to firms recommended by veterinary surgeons, (*b*) limit the use of penicillin to the treatment of bovine mastitis; and (*c*) it is obvious that a pharmacist who holds a licence under the Therapeutic Substances Act must be granted a licence by another Ministry before he can supply penicillin to veterinary surgeons. It will be seen, therefore, that it is illegal for pharmacists who are not licensed by the Minister of Supply (i) to dispense a veterinary surgeon's prescription for penicillin; (ii) to supply penicillin to a veterinary surgeon; (iii) to supply penicillin to a firm which is licensed by the Minister of Supply for veterinary purposes. It may also be observed that the maximum penalty to which a pharmacist renders himself liable if he contravenes these regulations is £500 and/or imprisonment for one year, or, on indictment, £5,000 and/or penal servitude for 14 years. In the case of a licence under the T.S.A. provision in the Regulations is made for an inspection of the premises to be undertaken by the Ministry of Health; no such inspection appears to be contemplated before the Ministry of Supply grant licences to firms to supply veterinary surgeons. Treatment of mastitis in cows is said to consist of infusion of the udder with a solution of sodium penicillin 20,000 to 50,000 units in 100 mils (see *Canadian J. Comp. Med.*, 1946, **10**, 16) at 24-hour intervals for two or more days. Preparation can either be left to the veterinary surgeon, or the solution can be made by the pharmacist—it is not a task which should be entrusted to non-pharmaceutical firms which in market towns and rural areas sometimes act as suppliers of veterinary medicines.

"We expect that pharmacists generally will take serious exception to the form of procedure which the Ministry of Supply have thought it expedient to introduce. For the first time in our knowledge a Government Department has taken the view that pharmacists are not the primary suppliers of medicines—the fact that the medicine is for animals and not for humans does not affect the situation. This decision has been taken by a Ministry that appears to be completely out of touch with the pharmaceutical profession and with pharmaceutical procedure. Once again no consultation with either the Society or the N.P.U. was held before the decision to grant these licences was taken. Nor (so we are advised) is the present supply position alone justification for the course taken by the Ministry. It is quite evident that the Ministry is working in a vacuum, that it has no background of knowledge of the way in which the trade itself tackled problems such as this before the Ministry came into existence, and it fails to recognize the fact that of all industries the drug trade in this country is probably the best organized and can look after its own problems, especially if it is left to do so without departmental interference. Now that the door has been opened for the use of penicillin in cattle it must be made available for veterinary use through the same channels that dangerous and potent drugs are supplied—without the restraining effect of licence procedure."

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"Onlooker" contributes the following note to the same issue: "The notice issued by the Minister of Supply regarding the arrangements by which a veterinary surgeon may obtain supplies of penicillin for use in his practice makes very odd reading. The Minister, like some of his colleagues, seems to have gone the longest way round to reach a very easy end. How much more simple it would have been for him to say that pharmacists may now dispense prescriptions or supply orders for penicillin signed by veterinary surgeons marked 'For veterinary purposes only'! But common sense and practical knowledge are rare commodities in Whitehall nowadays. In this connection I have considerable pleasure in passing on the following story which appears in a letter in last week's *Time and Tide*:—A veterinary surgeon was recently given the important special job of trying to cure sterility in cows, a matter which is now extremely serious. He had great difficulty in getting petrol to visit the different farms, and finally saw the Head of the Petrol Board in the local county town, and explained to him the urgency of his requirements, stressing the importance of the milk supply. 'Yes,' replied the official. 'Of course I realize the importance of the milk supply, but what has that got to with cows having calves?'"

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PERSONAL

Birth.—Cole-Powney.—On July 23rd, 1946, at the Cedar Court Nursing Home, Sutton, Surrey, to Norman and Kathleen Cole-Powney, M.R.C.V.S. (*née* Hernaman-Johnson), 61, Ruskin Road, Carshalton—twin daughters (Janet Maureen and Anne Kathleen).

. . . . .

Marriages.—Brown—Birkbeck.—At Purley, Surrey, on July 27th, 1946, Philip Leonard Brown, B.SC., M.R.C.V.S., only son of Mr. and Mrs. G. C. Brown, of "Crantock," Shelburne Road, Calne, Wiltshire, to Mary Coward Birkbeck, only daughter of Mr. and Mrs. H. J. Birkbeck, of "The Barn," Briar Hill, Purley.

Hamilton—Girvan.—On July 15th, 1946, at Airdrie West Parish Church, Andrew Hamilton, M.R.C.V.S., only son of Mr. A. Hamilton, 3, South Robertson Place, Airdrie, and of the late Mrs. Hamilton, to Moira Earle Maclean, younger daughter of the late Mr. and Mrs. James Girvan, 5, Woodburn Avenue, Airdrie.

. . . . .

Forthcoming Marriage.—Morgan—Calder.—The engagement is announced between Mr. Kenneth Urquhart Morgan, M.R.C.V.S., the elder son of Mr. and Mrs. W. E. Morgan, "Meadowfield," South View Road, Christchurch, Hants., and Barbara Joy, elder daughter of Mr. and Mrs. A. Calder, 36, Marshalswick Lane, St. Albans, Herts.

. . . . .

A French veterinary surgeon (30; married) with practice in Ecouen (18 miles north of Paris) wishes to be accepted as a guest in the family of an English confrère whose practice would preferably be near or within a large city, for a fortnight summer vacation, but on condition that he will be placed a short time later in a position to reciprocate by receiving his host in Ecouen, visiting the clientele, and seeing Paris with him.

Interested readers are requested to write directly to Dr. René Quetard, Vétérinaire, Ecouen (S. & O.), France.

* * * * *

R.C.V.S. OBITUARY

The Late Mr. H. H. Aldred, M.R.C.V.S.

"E. R. C." supplements as follows our notice of the death of Mr. H. H. Aldred, M.R.C.V.S., of "Moorfield," Rowton, Chester, recorded with deep regret in our last issue:—

"Mr. Aldred, who was in his 68th year, was widely known in the county of Cheshire, he having practised as a veterinary surgeon at Chester for some 46 years. He was also a successful farmer, having farmed 'Littleton Old Hall' farm, near Chester, until his health began to fail some three years ago.

"Always courteous and helpful, he was held in high esteem by his colleagues and agriculturalists generally throughout the county. For many years he took a keen interest in the affairs of the Lancashire Veterinary Association and was a Past-President of this body. He was a local Veterinary Inspector of the Ministry of Agriculture and Fisheries and also, for many years, was Veterinary Officer to the Corporation of Chester."

The funeral service, which took place at Christleton Parish Church on July 13th last, was attended by a large company which included many of his professional colleagues.

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ARTIFICIAL INSEMINATION

Following the death of Mr. Hugh Wyllie and the resignation of Mr. Denis Brown, the Minister of Agriculture has appointed Dr. R. F. Montgomerie and Mr. C. Nevile to be members of his Central Advisory Committee on Artificial Insemination.

To enable the centres operated by bodies other than the Milk Marketing Board to be represented on the Committee, the Minister has decided to increase by two the membership of the Committee. Mr. John Edgar has been appointed to fill one of the consequential vacancies; the other will be filled shortly.

* * * * *

B.M.A. AND THE HEALTH SERVICE

Referendum on Negotiations

At the three-day representative annual meeting of the British Medical Association, held last week at Tavistock Square, London, Dr. J. B. Miller, of Bishopbriggs, Lanarkshire, the Chairman, presided, and Sir Hugh Lett was elected President for the ensuing year in succession to Mr. H. S. Souttar. Dr. H. Guy Dain, of Birmingham, was re-elected as Chairman of the Council.

A discussion lasting several hours on the National Health Service took place in which members gave their views both for and against the proposed regulations. The majority of the speakers spoke in support of the decisions already taken at a previous meeting which empowered the Council to take action against the Bill. Some speakers, however, uttered a note of caution when they pointed out that the Bill was already nearly law and that it would not be prudent for the medical profession to refuse to comply with an Act of Parliament representing the will of the people.

Eventually it was agreed, by a large majority, to take a referendum of the whole profession on the question whether they should enter into negotiations with Mr. Bevan on the National Health Service regulations. The conference agreed to a resolution that no practitioners should accept membership of any committee or board established under the National Health Service Bill until the result of the forthcoming plebiscite of doctors is known.

It was also decided at the annual general meeting of the Association, which also was held, that the Council should make personal contact with each member of the Association to ascertain his or her views as soon as this could be arranged.

President on Unity

Sir Hugh Lett, in his presidential address, referred to the close relations that had developed between the Royal Colleges and the Association. This increasing co-operation, he said, must give satisfaction to those who looked ahead and saw the dangers which might arise from State control over the profession in their care of the sick. The high standard of British medicine and its prestige were due in no small measure to the freedom the profession had hitherto enjoyed. It was a freedom unfettered by the trammels, the frustrations and the infinite delays of bureaucracy, and it was, above all, a freedom untouched by the ebb and flow of politics. In the uncertain months and years which lay ahead it was vital that the medical profession should be united and able to speak with one voice, otherwise it could not hope to have the influence that was essential if the interests of the sick were to be safeguarded to the full and the members of the profession were to be given proper consideration.

Proposals for affiliation between the British Medical Association and the Medical Association of South Africa were approved, and awards of the Stewart Prize, established for the recognition and promotion of research into the origin, spread and prevention of epidemic disease, which consists of a certificate and cheque for £50, were made to Professor Major Greenwood, of Loughton, Essex, and to Dr. W. N. Pickles, of Aysgarth, Yorkshire.

ANIMAL HEALTH RESEARCH AT ABERYSTWYTH

For the first time in any British University a successful effort is being made at the University College of Wales, Aberystwyth, to unite in a research unit those component parts of animal husbandry termed nutrition, breeding and management, with those hitherto termed veterinary medicine or veterinary science.

This work is being carried on at the recently constituted Department of Animal Health under Professor Alastair N. Worden, M.A., B.SC., M.R.C.V.S., A.R.I.C. (Director), with Mr. Richard Phillips, M.SC., A.R.I.C., as assistant director, the chair having been endowed through the generosity of Lord Milford. The Biochemistry and Physiology Section is under the direction of Dr. W. Charles Evans, who was formerly with Sir Alexander Fleming at St. Mary's Hospital, and the Parasitology and Ecology Section under Mr. E. Parker Pollard, seconded from the Cooper Technical Bureau. Close collaboration is maintained with the Veterinary Investigation and other Departments of the College. This is the only University Department of its kind in the British Isles.

Four Programmes

In addition to a wide range of general studies, four main investigational programmes, each of which is likely to occupy several years of intensive research, have been selected.

First, said Professor Worden in an interview, it was essential that new techniques be devised to estimate the productive value for livestock of the pastures now available, largely as a result of the pioneer work of the Welsh Plant Breeding Station at Aberystwyth. "We need to know," he stated, "not only the amount of meat or milk that can be obtained under given conditions but also the quality of such produce and the effect of production upon the grazing animal." Preliminary trials had been commenced at Pantyrhuad Farm, St. Clears, Carmarthenshire.

Secondly, they are to tackle the great problem of winter feeding. From the standpoint of human nutrition this problem is of major importance.

Thirdly, the relationship of nutrition to disease and immunity in early calfhood, a fundamental problem that might shed light not only on losses in dairy herds but also prove of comparative value to those engaged in the study of childhood diseases, and fourthly, a projected survey of animal health and productivity on selected farms in West Wales.

A vast series of problems affecting the production of food from animals arises from the major diseases of cattle, sheep, pigs and poultry. The loss from such sources to the British livestock industry is unknown, but has been computed by a recent Government committee to reach the staggering figure of £30,000,000 annually.

Population trends in various species will also be investigated. Both the human and bovine populations of our country are suffering from an infertility which may be temporary or permanent. In the one case the deliberate practice of birth control is usually blamed for the decline in the birth rate, but, points out Professor Worden, this cannot exclude the consideration of natural causes. There was enough evidence from various wild species and from the coincidental trend in dairy cattle to justify an examination from this new angle.

"We are under no delusions," said Professor Worden, "concerning the magnitude of our tasks or the ambitious nature of our programmes and we shall need all the collaboration and goodwill possible not only from our colleagues at Aberystwyth, but also from practising agriculturalists, veterinarians and medical men."

* * * * *

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Swine Fever:

Isle of Ely.—The Allotments, Gas Road, March, Cambs. (July 27th).

Lincs. (*Lindsey*).—Royalty Farm, Eastville, and Ivy Farm, New Leake, Boston, Lincs. (July 23rd).

* * * * *

INSTITUTE OF MEAT

A great step forward in bringing the meat trade to higher status has been taken in the formation of an Institute of Meat, and the membership of a widely representative Council includes Dr. John Hammond, of Cambridge University, and, in Dr. W. R. Wooldridge, a member of our profession.

The purpose of the Institute is explained in the Memorandum as:

To promote the general advancement of education, technical and general, among members of those connected with the general interests of the Meat and Allied Trades, and to maintain and extend the usefulness of these trades for the advancement of the trade and the public.

To facilitate the exchange of information and ideas on matters of education or of general interest.

To devise and impose means for testing the qualifications of candidates for admission to the membership of the Institute by examination in theory and in practice or by any other tests and to grant certificates to successful candidates.

To hold conferences and meetings for the discussion of educational subjects, the reading of papers and the delivery of lectures; to issue copies of papers, lectures and reports from time to time to members of the Institute, and generally to collect, collate and publish information relating to education and research.

To exercise supervision over the members of the Institute, and to secure for them such standing as may assist them in the conduct of their business or discharge of their duties.

The usual powers have, of course, been taken, so that the Institute may, if it is felt desired, promote exhibitions; form a library or libraries; make grants of money, books, etc., for promoting education research and invention; create scholarships; give prizes, medals and other rewards; purchase of property, etc.

There will be four classes of members of the Institute, namely:—

Honorary Fellows—who shall be elected by the Council as such.

Fellows—who shall be elected by the Council as such from Members of the Institute other than Honorary Fellows.

Members—who shall be elected by the Council as such from Associates and other persons.

Associates—who shall be elected by the Council as such from students and other persons.

In addition to this, approved students will be registered without the rights of actual membership.

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FISHERIES IN WAR-TIME

H.M. Stationery Office have published a report of the Ministry of Agriculture and Fisheries entitled "Fisheries in War-time" (on sale at H.M. Stationery Office or from any bookseller, price 1s. 6d. net).

The last report on the Fisheries of England and Wales appeared in respect of the year 1938. The present report covers the years 1939-44 both inclusive, and, in fact (except in the case of the statistical tables), carries the story up to the conclusion of hostilities in 1945. Normally the reports on the Fisheries of England and Wales appear in two parts, one being devoted entirely to statistical tables. On this occasion, as the report deals with several years, the statistical tables have necessarily had to be somewhat curtailed and are included with the rest of the report in one volume.

The report contains, of course, much that is peculiar to the war years, and includes chapters on matters that would not normally figure in one of these reports, *i.e.*, the Effect of War on Fishing, Control of Fishing Operations, Fishermen at War, War Risk Insurance, Man Power Problems, Price Control and Post-war Reconstruction. Chapters on subjects normally covered in the earlier reports, such as Review of Landings, Whaling and Scientific Investigations are also included, and it is hoped that, in the words of the preface, the contents of the report "may commend themselves, by the story they tell of the part played by an essential but unassuming section of the community, to an appreciative public."

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"ABSTRACTS OF WORLD MEDICINE"

Under the above title the first issue of a new monthly abstracting journal will be published by the British Medical Association in January next year. A second monthly journal will appear at the same time under the title of *Abstracts of World Surgery, Obstetrics and Gynaecology*. The work of these journals, and of other abstracting services, will be conducted under the general direction of the Editor of the *British Medical Journal*, and the Council of the Association has just appointed Dr. G. W. M. Findlay as Editor of *Abstracts*, and Dr. S. S. B. Gilder as Assistant Editor.

* * * * *

"BIOLOGICAL ABSTRACTS"

The report for 1945 of the Philadelphia publication *Biological Abstracts* [Editorial Offices: University of Pennsylvania, Philadelphia 4, Pa.] takes the form of a review of the progress made during the 20 years since the foundations were laid by the biologists' Joint Publications Committee, representing the National Academy of Sciences, the Union of American Biological Societies and the American Association for the Advancement of Science.

Nineteen volumes have been published, comprising abstracts of over 250,000 research papers, and an agency for the abstracting of the world's research output in biology has been put on a secure basis for steady expansion. With more than 3,000 active collaborators, *Biological Abstracts* has become one of the largest co-operative enterprises instituted by a scientific group. Publication in sections, covering specific fields, has been initiated. This plan represents a successful compromise between the needs of institutions for full abstracting of the entire literature of biology, and the interests of individual subscribers in every field, who desire specialized services.

The steadily improving financial position of *Biological Abstracts* in recent years is reflected in its annual budgets which have increased from $40,000 in 1938 to $89,080 in 1945. The organization and early development were made possible by large foundation subsidies. When this aid was discontinued in 1935, means were devised for continuance on a more nearly self-sustaining basis. The firm support of the principal biological societies has been expressed in annual contributions. Very generous financial aid has been received from the principal industrial concerns in the biological field.

"It is generally recognized," says the report, "that one of the greatest impediments to the advancement of science at the present time is the lack of effective means by which the findings of scientists—especially those of diverse nations and languages—can be brought to light, mobilized, and put to work. The conclusion is inescapable that the abstract journals of the world will, in the future, play a far more decisive role than at present in increasing the productivity of research."

* * * * *

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office.

	Price net	Post free
AGRICULTURE AND FISHERIES, MINISTRY OF:		
Fisheries in War-time. Report on the Sea Fisheries of England and Wales for the years 1939-44 inclusive. October 11th, 1945 (24-153)	s. d. 1 6	s. d. 1 8
STATUTORY RULES AND ORDERS, 1946:		
1108. Livestock (Import from Eire and the Isle of Man) Regulations. July 12th, amending the Livestock (Import from Eire and the Isle of Man) Regulations, 1945. (Published July 18th, 1946)	0 1	0 2

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ADVERTISERS' ANNOUNCEMENTS

Penicillin for use in Bovine Practice

Imperial Chemical (Pharmaceuticals) Limited announce that they have available both the sodium and calcium salts of penicillin in powder form. The freeze-dried sodium salt is supplied in 20 c.c. rubber-capped vials (cartons of ten) containing 0·1, 0·2, 0·5 and 1·0 mega unit. The calcium salt (in bulk) is issued in containers of 1, 10, 50 and 200 mega units.

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Penicillin "B.W. & Co."—Burroughs Wellcome & Co., 12, Red Lion Square, London, W.C.1, announce the availability for veterinary purposes (subject to the Control of Penicillin (No. 1) Order, 1946) of Penicillin Sodium, 0·1 mega unit (100,000 I.U.) in rubber-capped bottles and of "Wellcome" brand Sterile Diluting Fluid in 50 c.c. bottles.

Veterinary surgeons are reminded that if they wish to obtain supplies during the period August 1st to October 31st, 1946, they must specify the distributing firm on the form obtainable from the N.V.M.A.

August Holidays

The London offices of Burroughs Wellcome & Co. will be closed from 5.30 p.m. on Friday, August 2nd, to 9 a.m. on Tuesday, August 6th.

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DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
July 1st to 15th, 1946 ...	6	1	—	2	7
Corresponding period in—					
1945 ...	5	13	—	6	34
1944 ...	2	—	—	—	53
1943 ...	7	—	—	1	23
Total Jan. 1st to July 15th, 1946 ...	57	29	4	38	282
Corresponding period in—					
1945 ...	59	98	5	46	542
1944 ...	113	27	6	61	471
1943 ...	171	10	6	101	281

NOTE.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.

Tuberculosis Order of 1938

The number of bovine animals slaughtered under the Tuberculosis Order of 1938 during the period April 1st to June 30th, 1946, was 2,306.